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Maloney et al.

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(54) **ANIMATION CREATION AND MANAGEMENT IN PRESENTATION APPLICATION PROGRAMS**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

This patent is subject to a terminal disclaimer.

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(22) Filed: **Nov. 17, 2011**

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(51) **Int. Cl.**

G06T 13/80	(2011.01)
G06F 3/048	(2013.01)
G06T 13/00	(2011.01)

(52) **U.S. Cl.**

CPC ***G06T 13/00*** (2013.01); ***G06F 3/048*** (2013.01); ***G06T 13/80*** (2013.01)

(58) **Field of Classification Search**

USPC 345/473, 474

See application file for complete search history.

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Assistant Examiner — Schiller Hill
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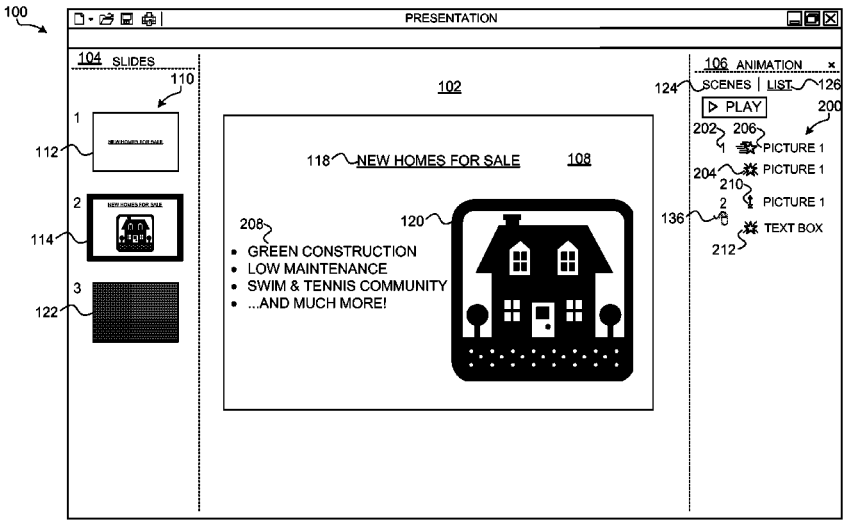
(57) **ABSTRACT**

An animation timeline is analyzed to determine one or more discrete states. Each discrete state includes one or more animation effects. The discrete states represent scenes of a slide in a slide presentation. The concepts of scenes allows user to view a timeline of scenes, open a scene, and direct manipulate objects in the scene to author animations. The animations can include motion path animation effects, which can be directly manipulated utilizing a motion path tweening method. To aid in direct manipulation of a motion path of an object, a ghost version of the object can be shown to communicate to a user the position of the object after a motion path animation effect that includes the motion path is performed. The ghost version may also be used to show a start position when a start point is manipulated.

20 Claims, 17 Drawing Sheets



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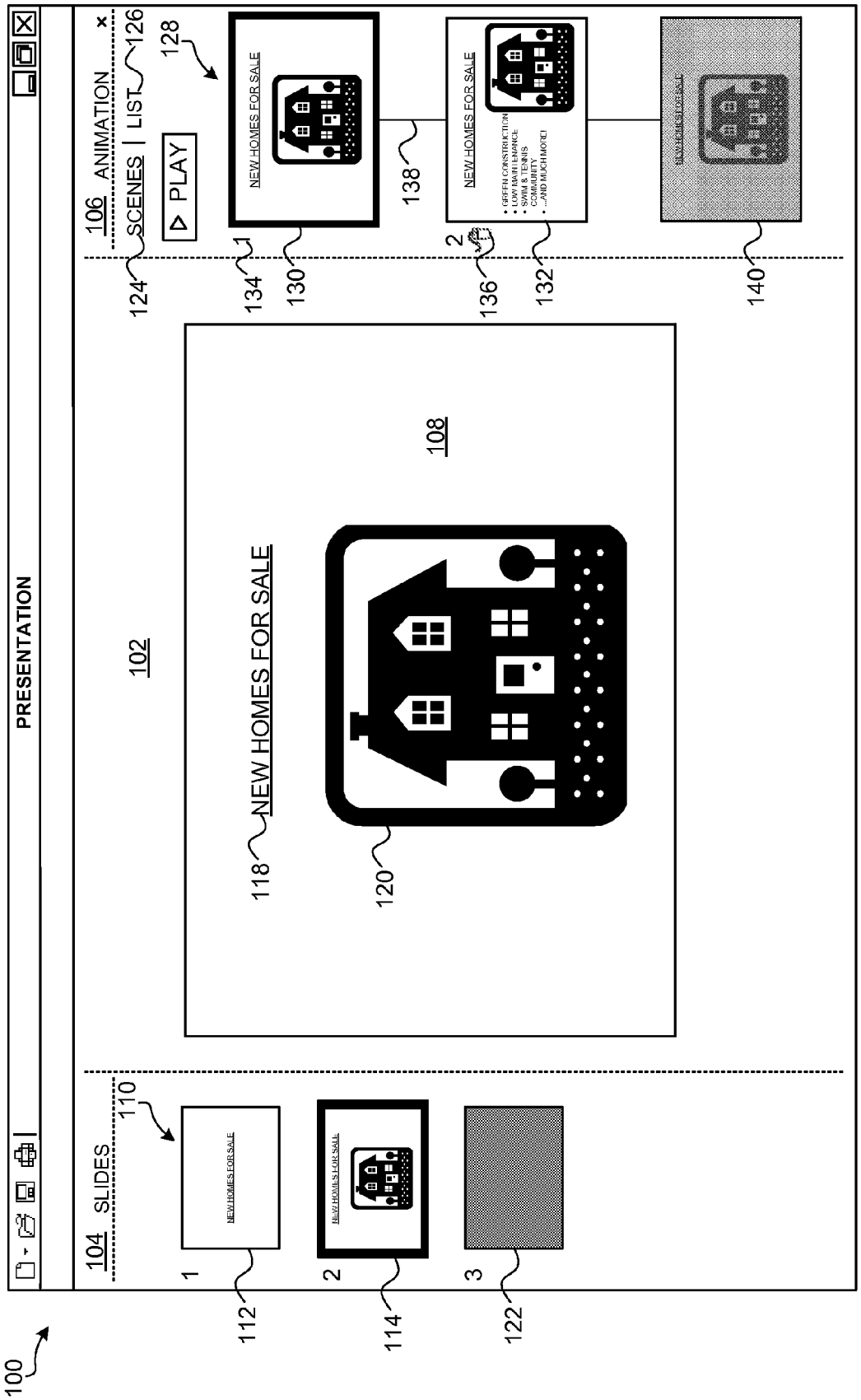
100
PRESENTATION
104 SLIDES
110
1
112
NEW HOMES FOR SALE
2
114
3
122
102
118 NEW HOMES FOR SALE
120
108
106 ANIMATION
SCENES | LIST
126
128
PLAY
124
NEW HOMES FOR SALE
134
130
138
NEW HOMES FOR SALE
• GREEN CONSTRUCTION
• LOW MAINTENANCE
• SWIM & TENNIS
COMMUNITY
• ...AND MUCH MORE!
2
136
132
140

FIG. 1

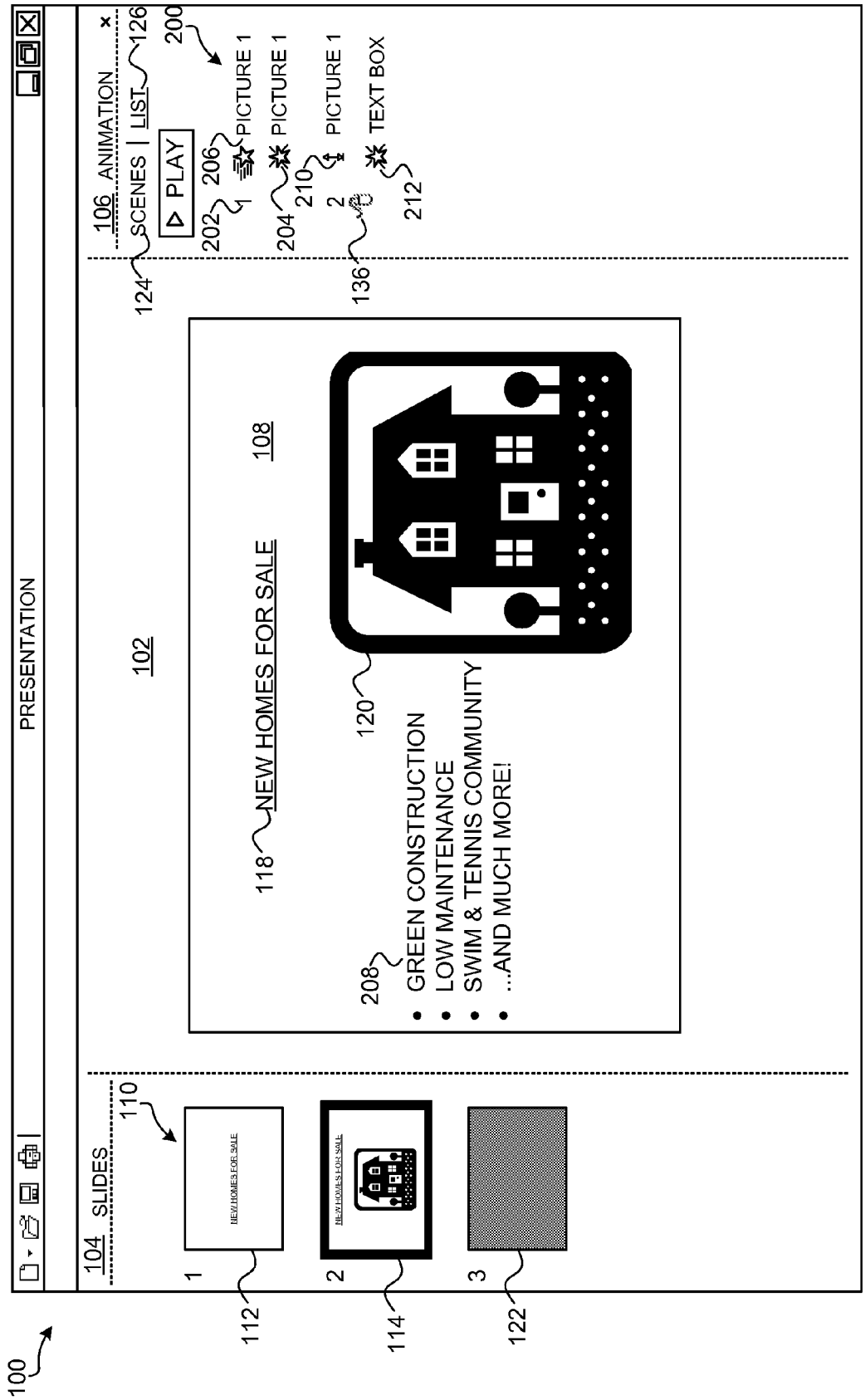
100
PRESENTATION
102
104 SLIDES
110
1
112
NEW HOMES FOR SALE
2
114
3
122
106 ANIMATION
SCENES | LIST
126
200
PLAY
202
206
1
PICTURE 1
204
210
PICTURE 1
2
PICTURE 1
212
TEXT BOX
124
136
108
118
NEW HOMES FOR SALE
120
208
• GREEN CONSTRUCTION
• LOW MAINTENANCE
• SWIM & TENNIS COMMUNITY
• ...AND MUCH MORE!

FIG. 2

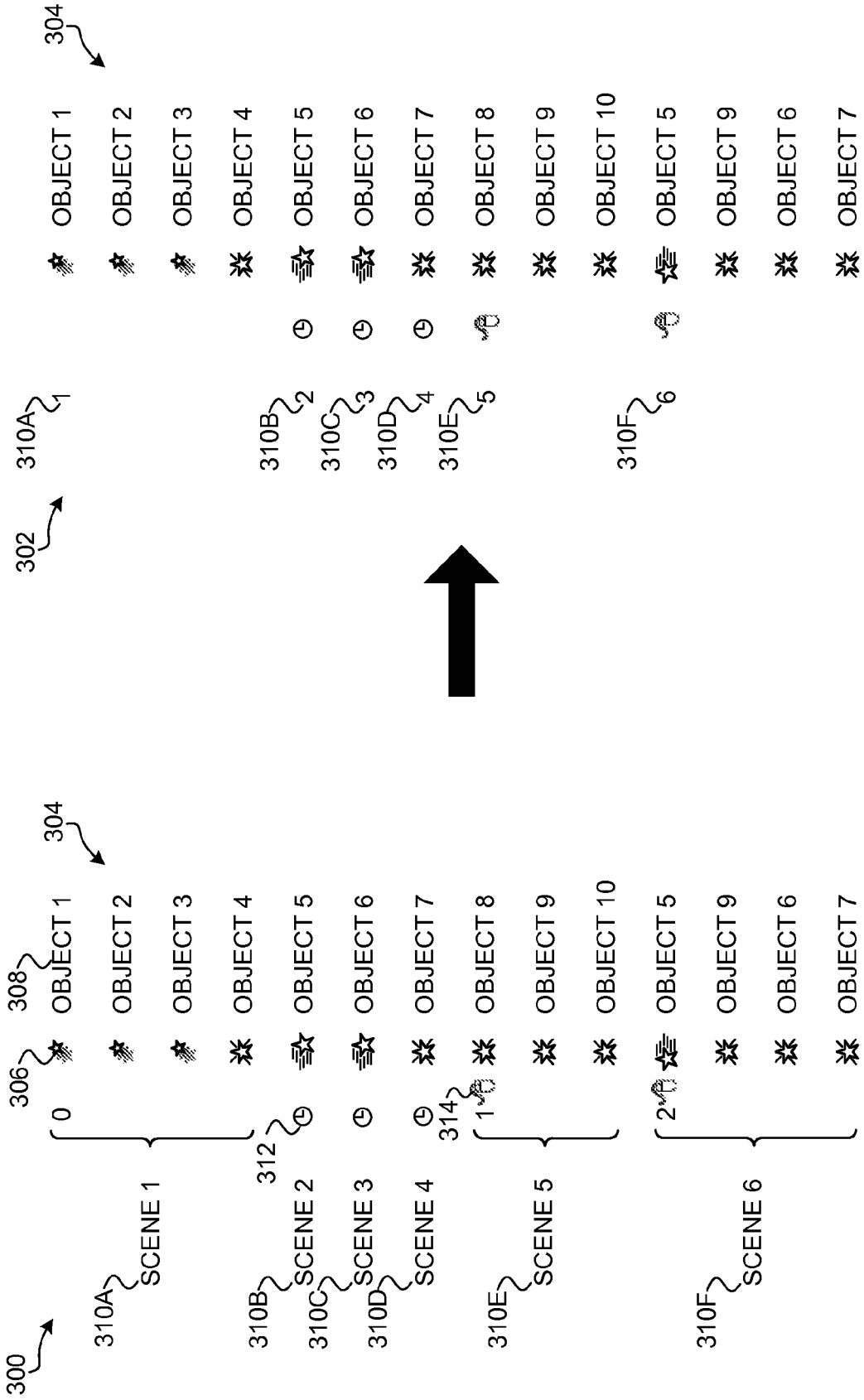
300
302
304
306
308
310A
310B
310C
310D
310E
310F
312
314
SCENE 1
SCENE 2
SCENE 3
SCENE 4
SCENE 5
SCENE 6
OBJECT 1
OBJECT 2
OBJECT 3
OBJECT 4
OBJECT 5
OBJECT 6
OBJECT 7
OBJECT 8
OBJECT 9
OBJECT 10
0
1
2
1
2
3
4
5
6

FIG. 3

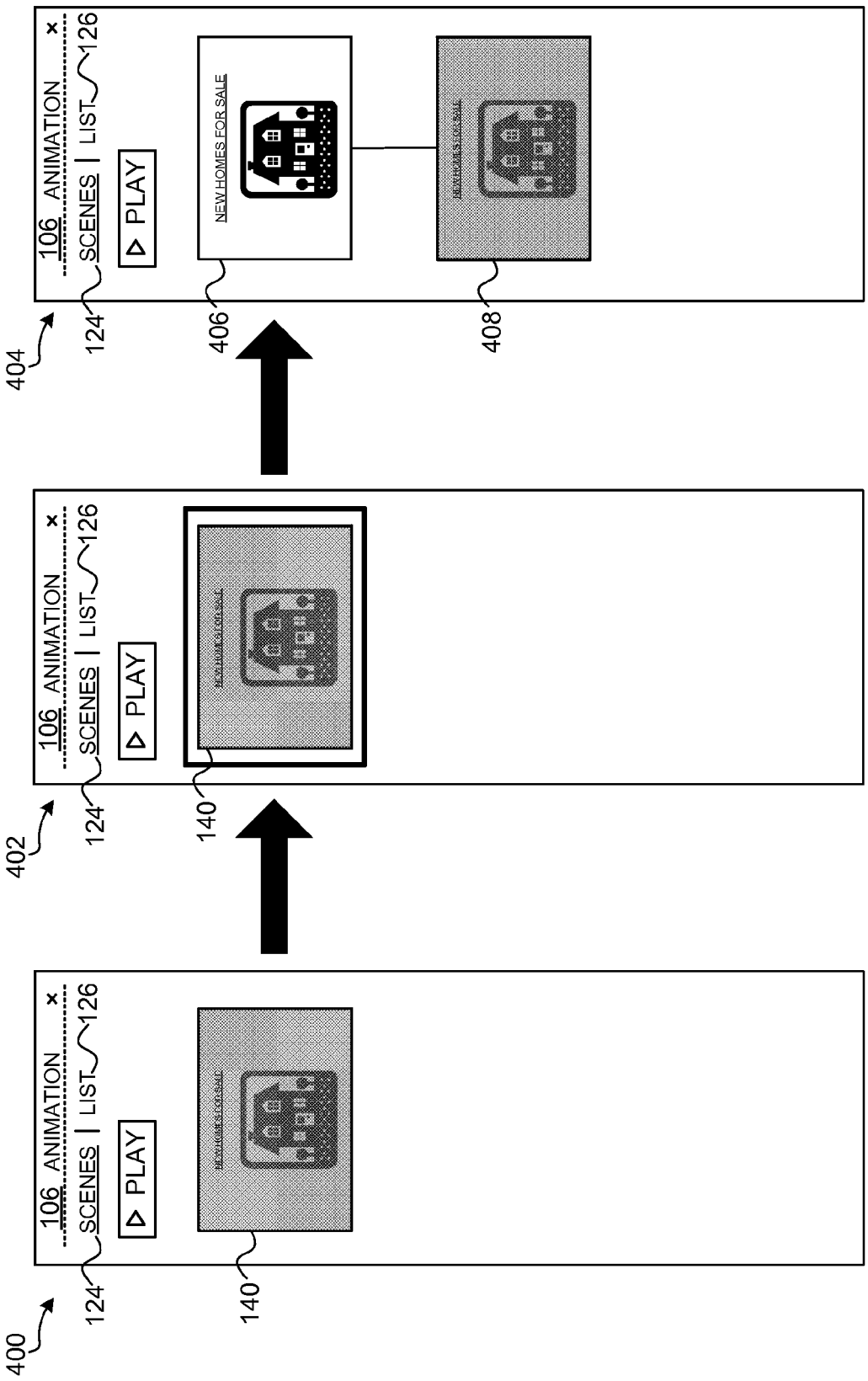
400
402
404
106 ANIMATION
SCENES | LIST
126
124
PLAY
140
406
408
NEW HOMES FOR SALE

FIG. 4A

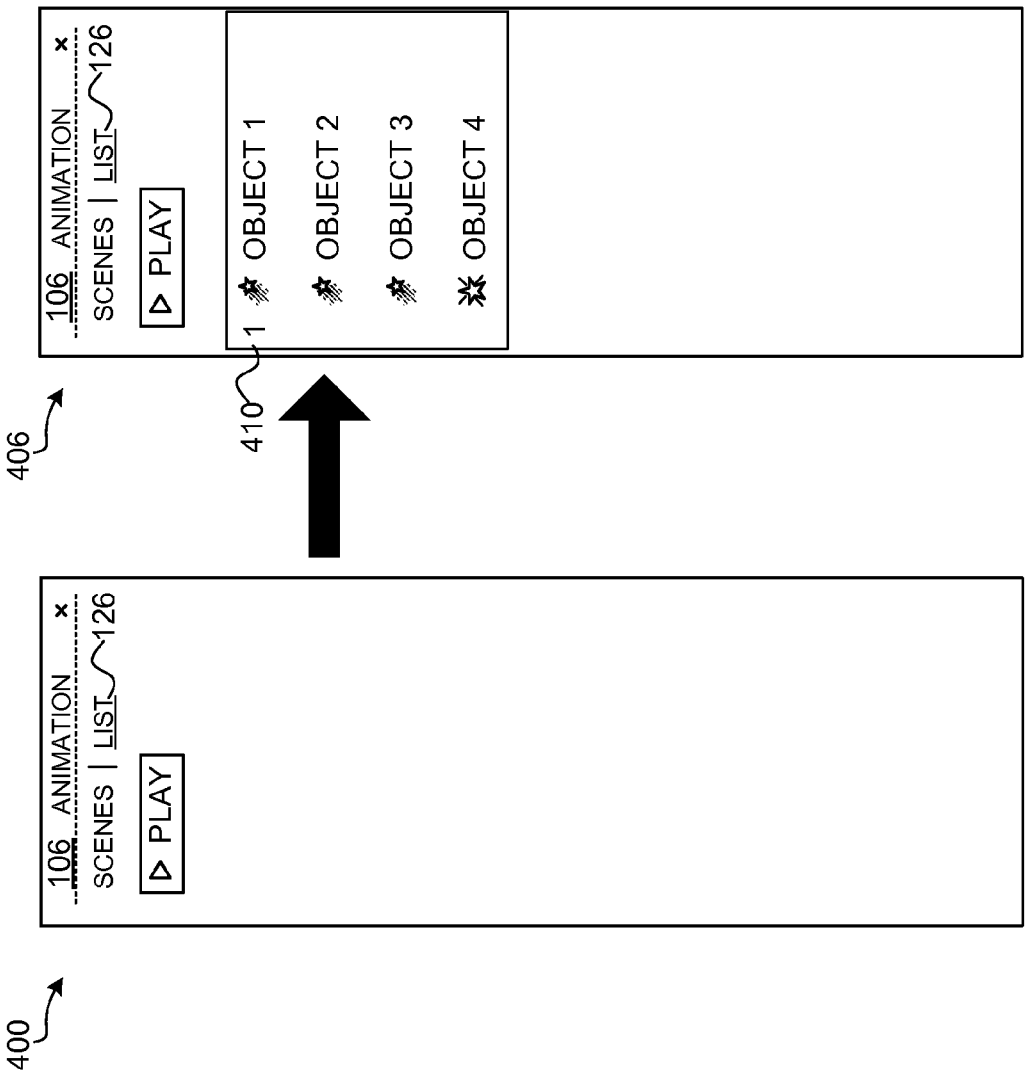
400
406
106 ANIMATION
SCENES | LIST 126
PLAY
410
1 OBJECT 1
OBJECT 2
OBJECT 3
OBJECT 4

FIG. 4B

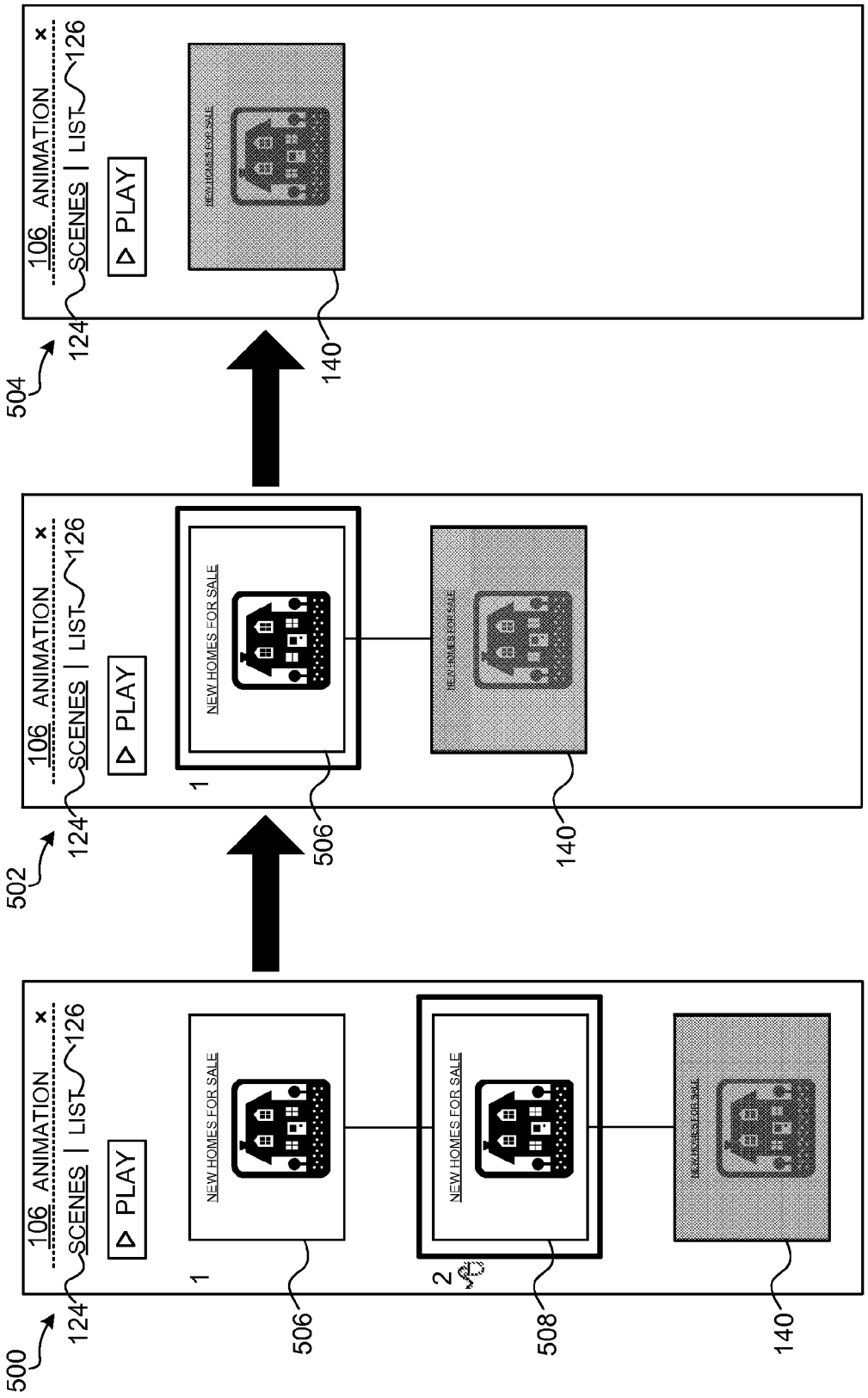
500
502
504
106 ANIMATION
SCENES | LIST
126
124
PLAY
NEW HOMES FOR SALE
1
2
506
508
140

FIG. 5A

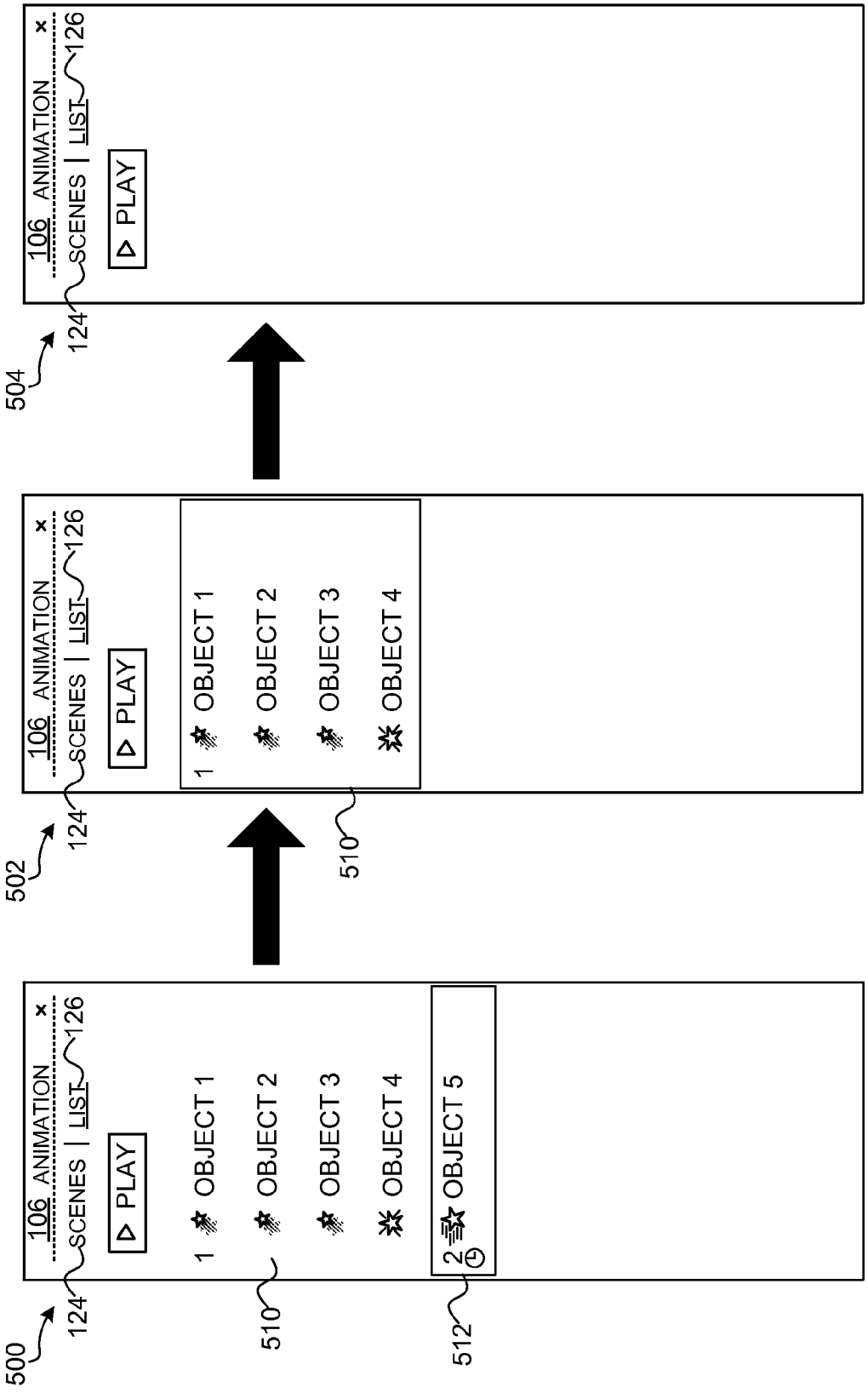
500
124
106 ANIMATION
SCENES | LIST
126
PLAY
1 OBJECT 1
OBJECT 2
OBJECT 3
OBJECT 4
2 OBJECT 5
510
512
502
124
106 ANIMATION
SCENES | LIST
126
PLAY
1 OBJECT 1
OBJECT 2
OBJECT 3
OBJECT 4
510
504
124
106 ANIMATION
SCENES | LIST
126
PLAY

FIG. 5B

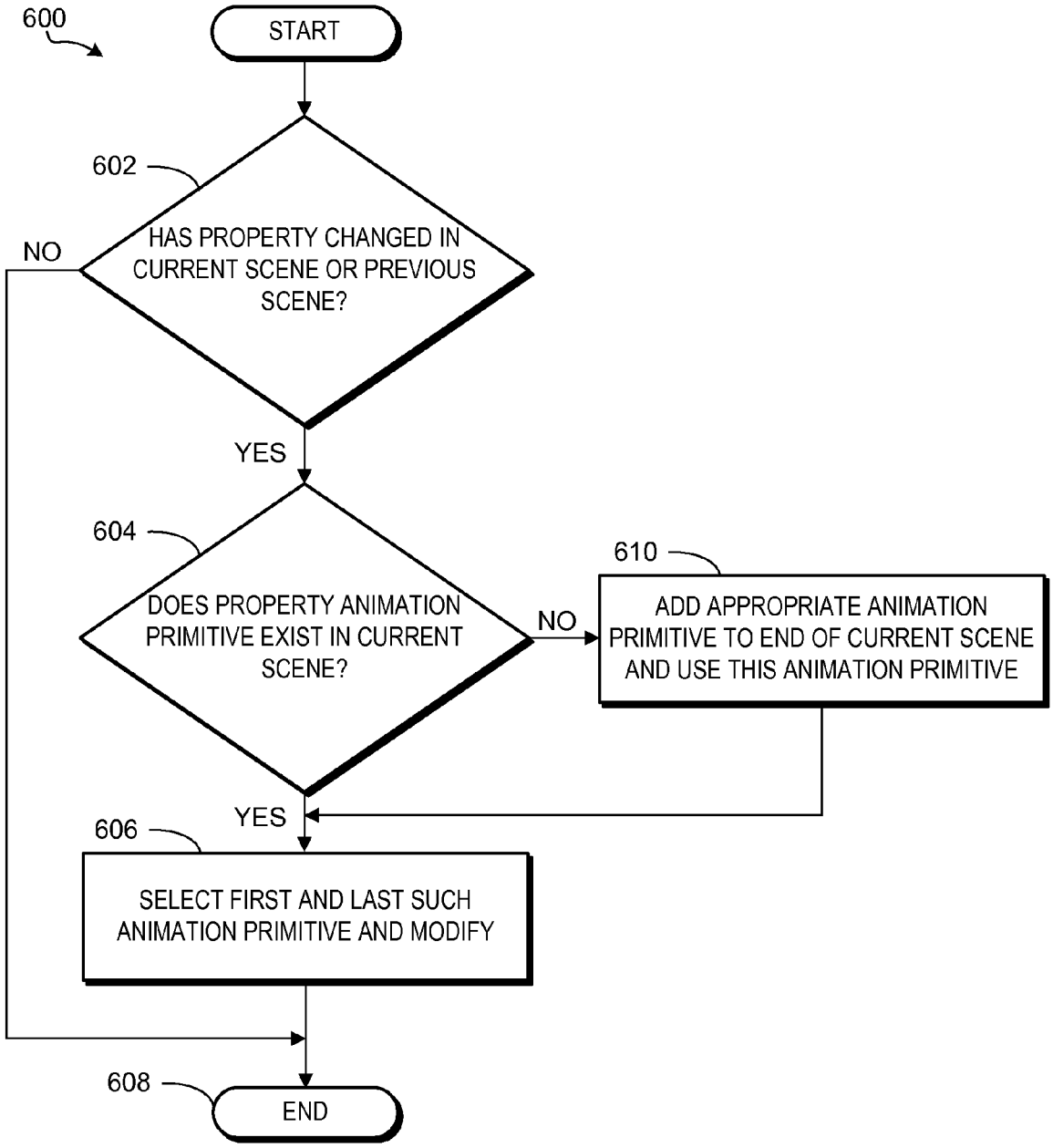
600
START
602
HAS PROPERTY CHANGED IN CURRENT SCENE OR PREVIOUS SCENE?
NO
YES
604
DOES PROPERTY ANIMATION PRIMITIVE EXIST IN CURRENT SCENE?
NO
610
ADD APPROPRIATE ANIMATION PRIMITIVE TO END OF CURRENT SCENE AND USE THIS ANIMATION PRIMITIVE
YES
606
SELECT FIRST AND LAST SUCH ANIMATION PRIMITIVE AND MODIFY
608
END

FIG. 6

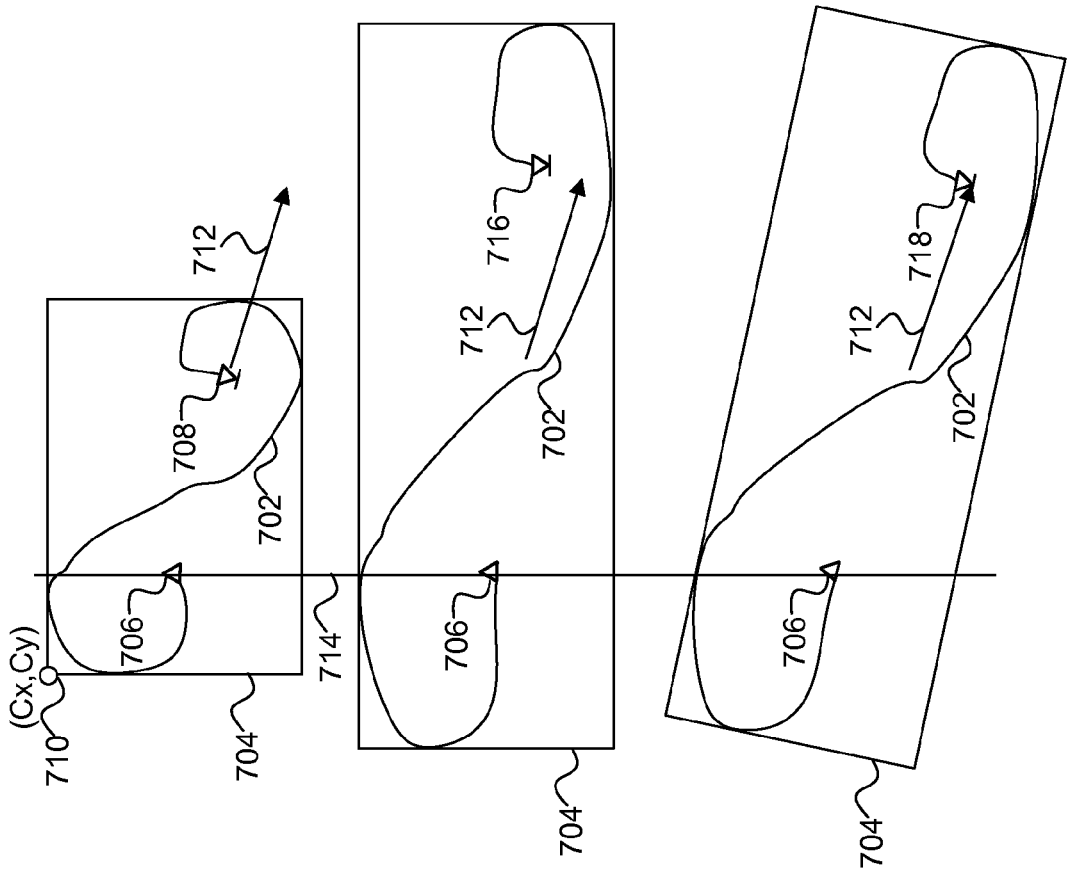
712
708
702
706
(Cx,Cy)
710
704
714
712
716
702
706
704
712
718
702
706
704

FIG. 7

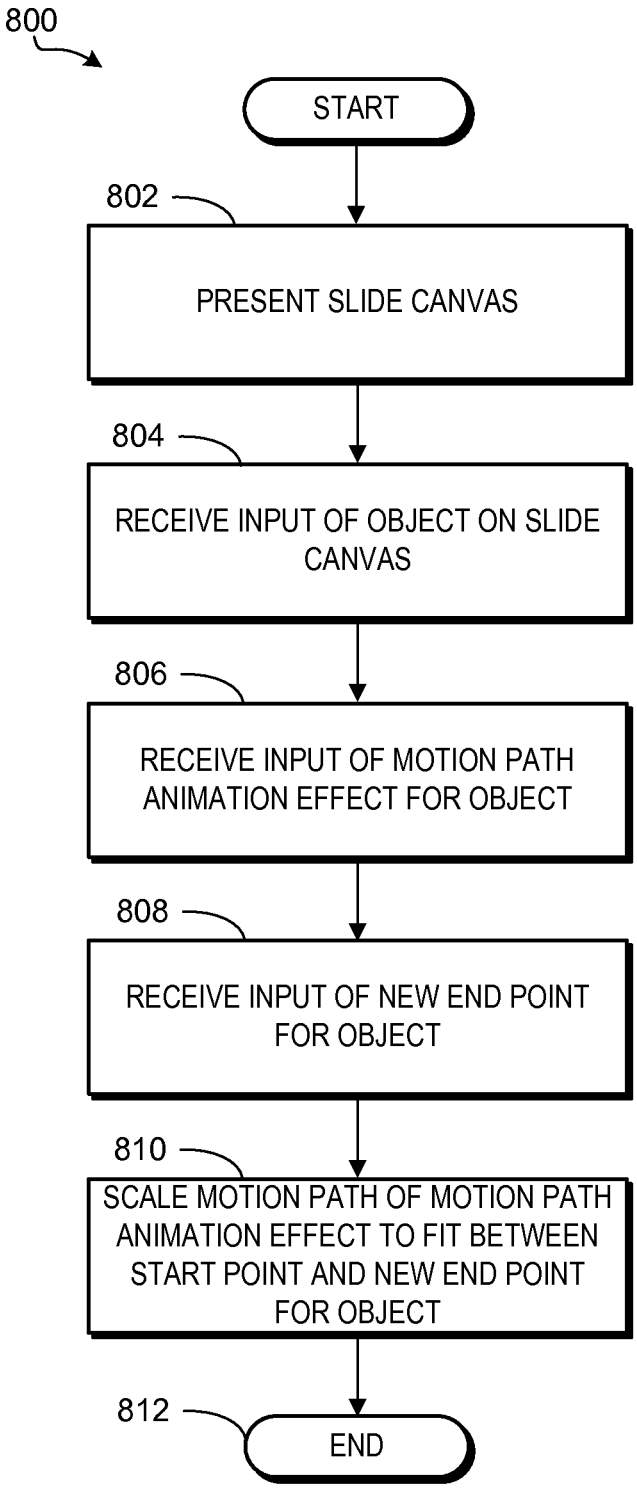
800
START
802
PRESENT SLIDE CANVAS
804
RECEIVE INPUT OF OBJECT ON SLIDE CANVAS
806
RECEIVE INPUT OF MOTION PATH ANIMATION EFFECT FOR OBJECT
808
RECEIVE INPUT OF NEW END POINT FOR OBJECT
810
SCALE MOTION PATH OF MOTION PATH ANIMATION EFFECT TO FIT BETWEEN START POINT AND NEW END POINT FOR OBJECT
812
END

FIG. 8

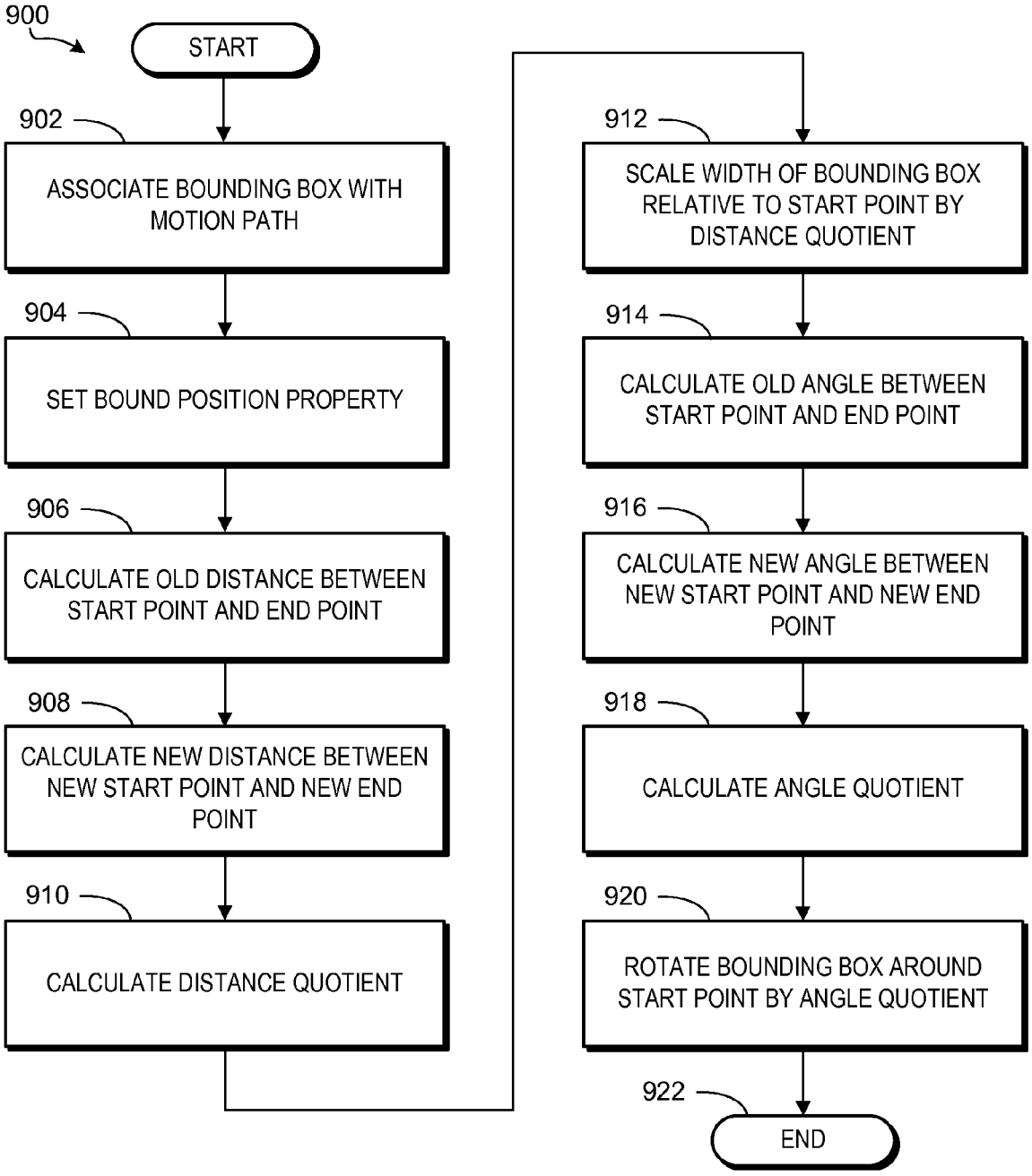
900
START
902
ASSOCIATE BOUNDING BOX WITH MOTION PATH
904
SET BOUND POSITION PROPERTY
906
CALCULATE OLD DISTANCE BETWEEN START POINT AND END POINT
908
CALCULATE NEW DISTANCE BETWEEN NEW START POINT AND NEW END POINT
910
CALCULATE DISTANCE QUOTIENT
912
SCALE WIDTH OF BOUNDING BOX RELATIVE TO START POINT BY DISTANCE QUOTIENT
914
CALCULATE OLD ANGLE BETWEEN START POINT AND END POINT
916
CALCULATE NEW ANGLE BETWEEN NEW START POINT AND NEW END POINT
918
CALCULATE ANGLE QUOTIENT
920
ROTATE BOUNDING BOX AROUND START POINT BY ANGLE QUOTIENT
922
END

FIG. 9

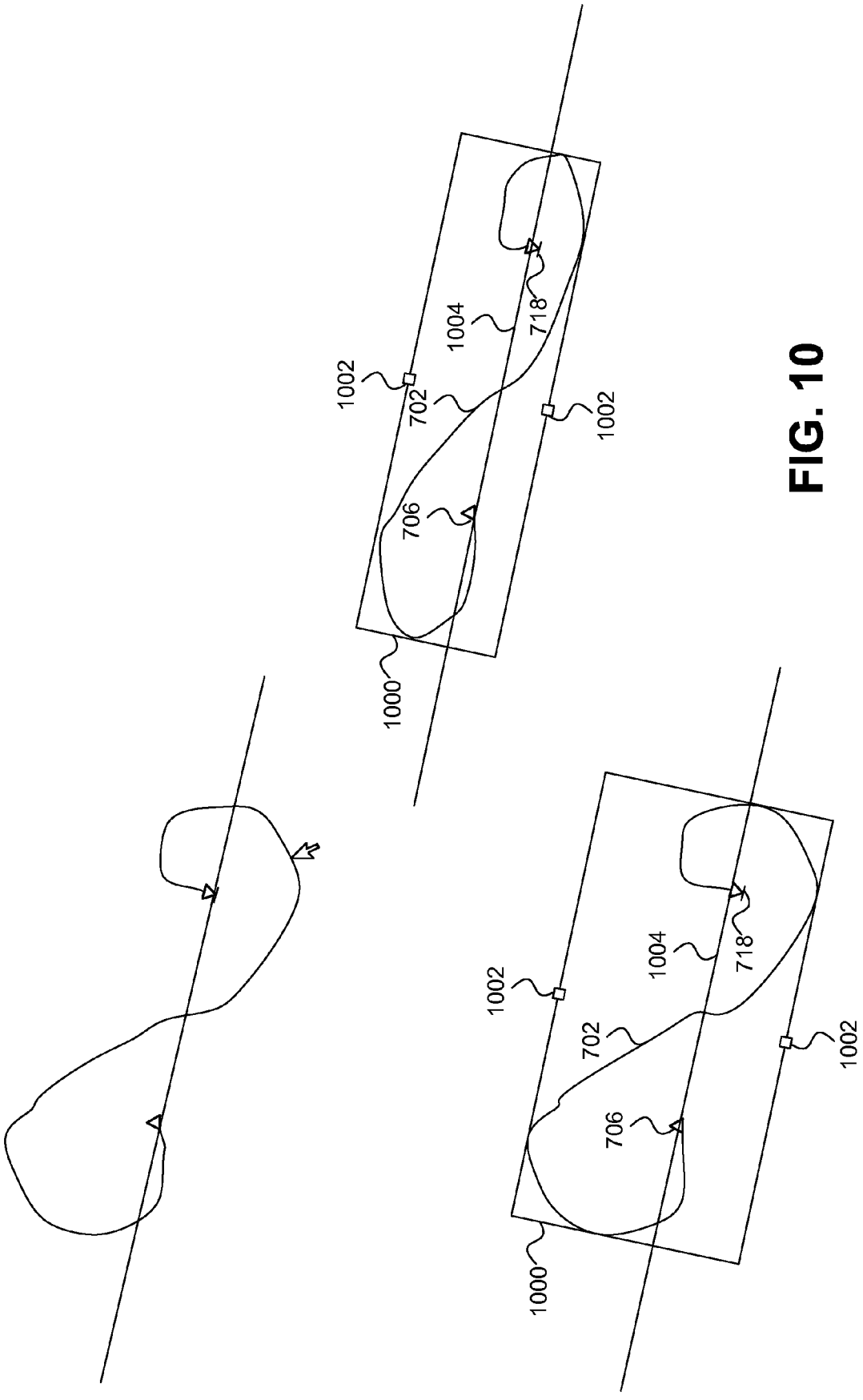
1002
702
1004
718
1002
706
1000
1002
1004
718
1002
702
1002
706
1000

FIG. 10

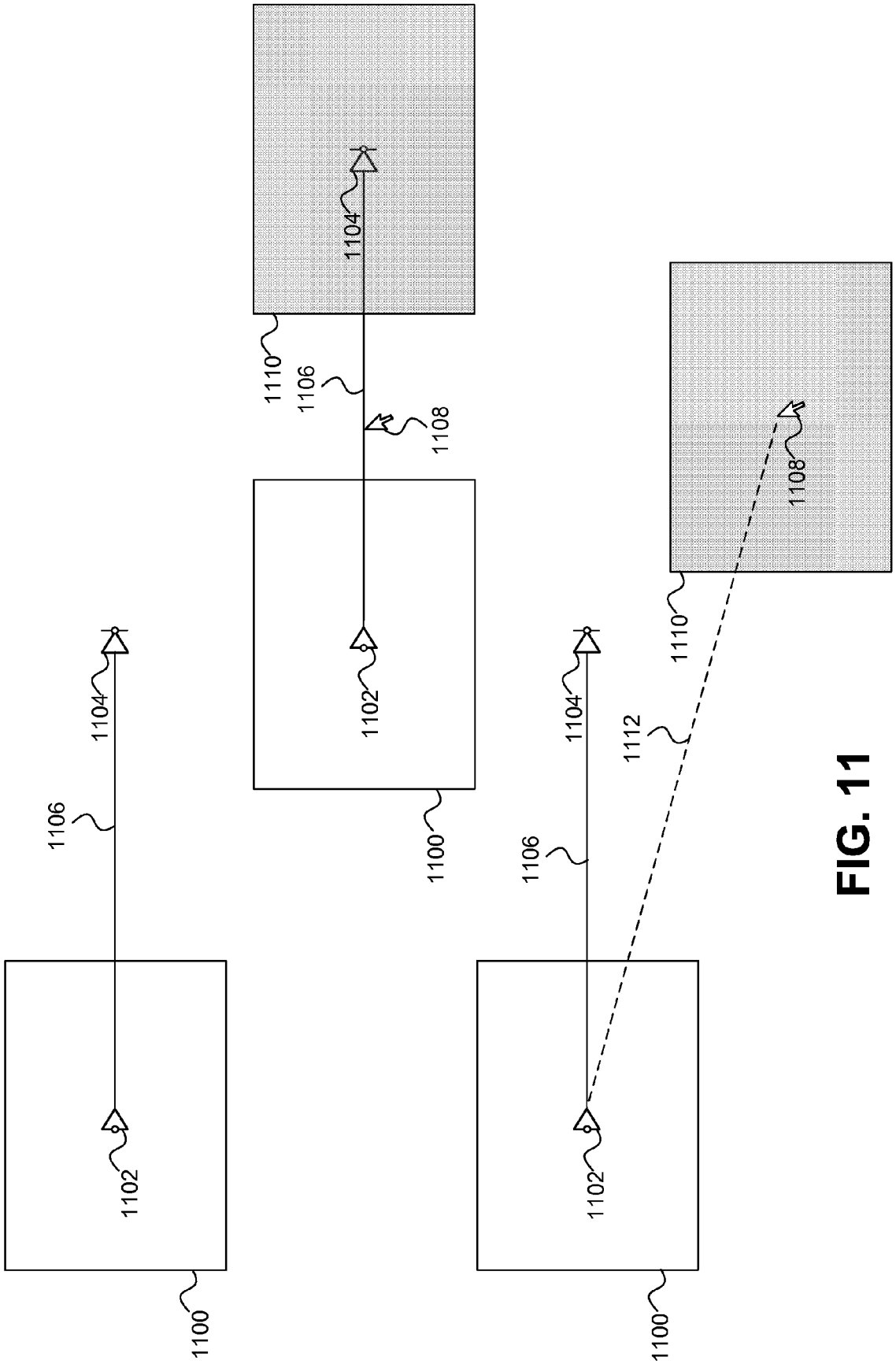

FIG. 11

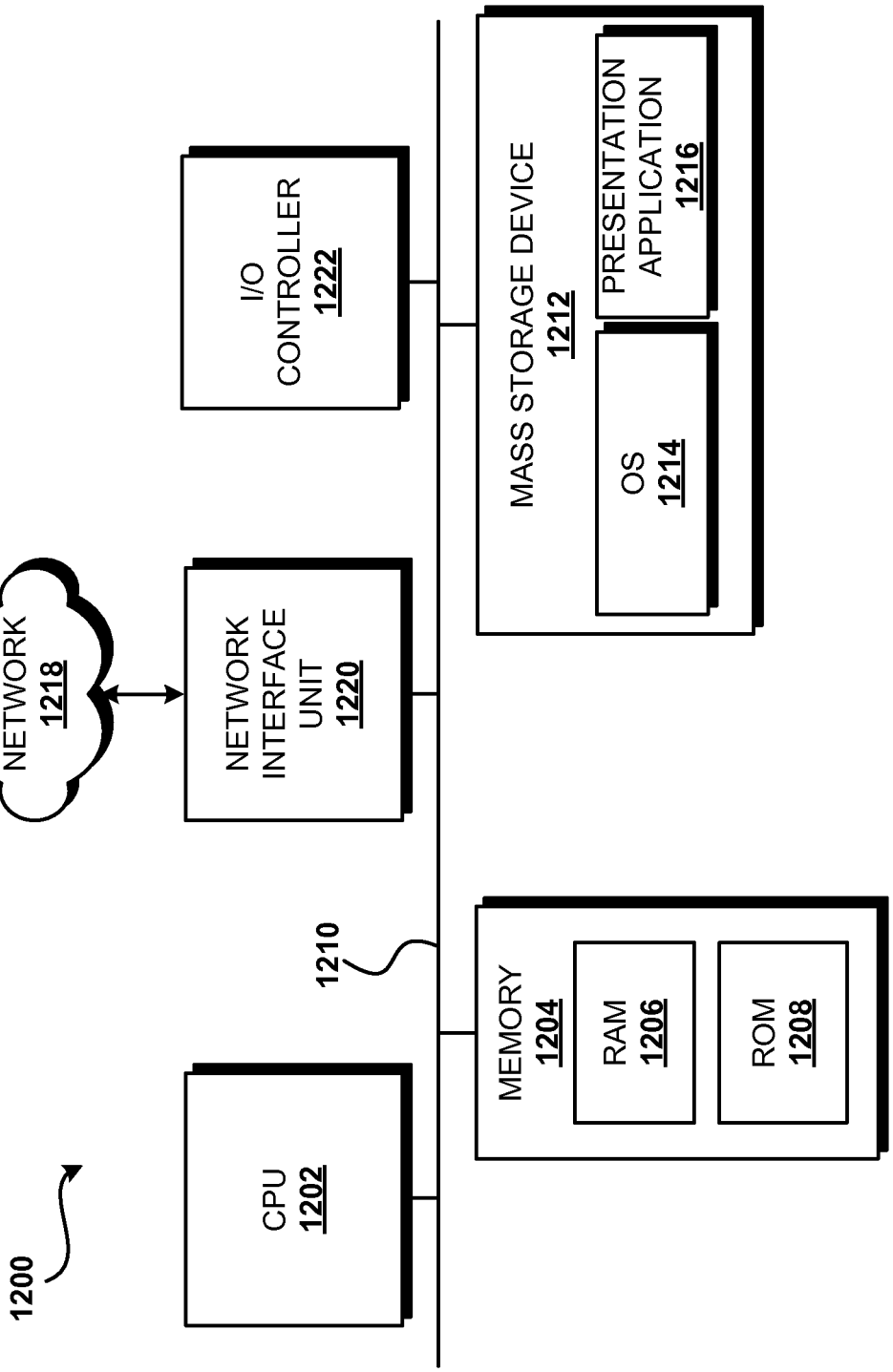
1200
CPU
1202
1210
MEMORY
1204
RAM
1206
ROM
1208
NETWORK
INTERFACE
UNIT
1220
NETWORK
1218
I/O
CONTROLLER
1222
MASS STORAGE DEVICE
1212
OS
1214
PRESENTATION
APPLICATION
1216

FIG. 12

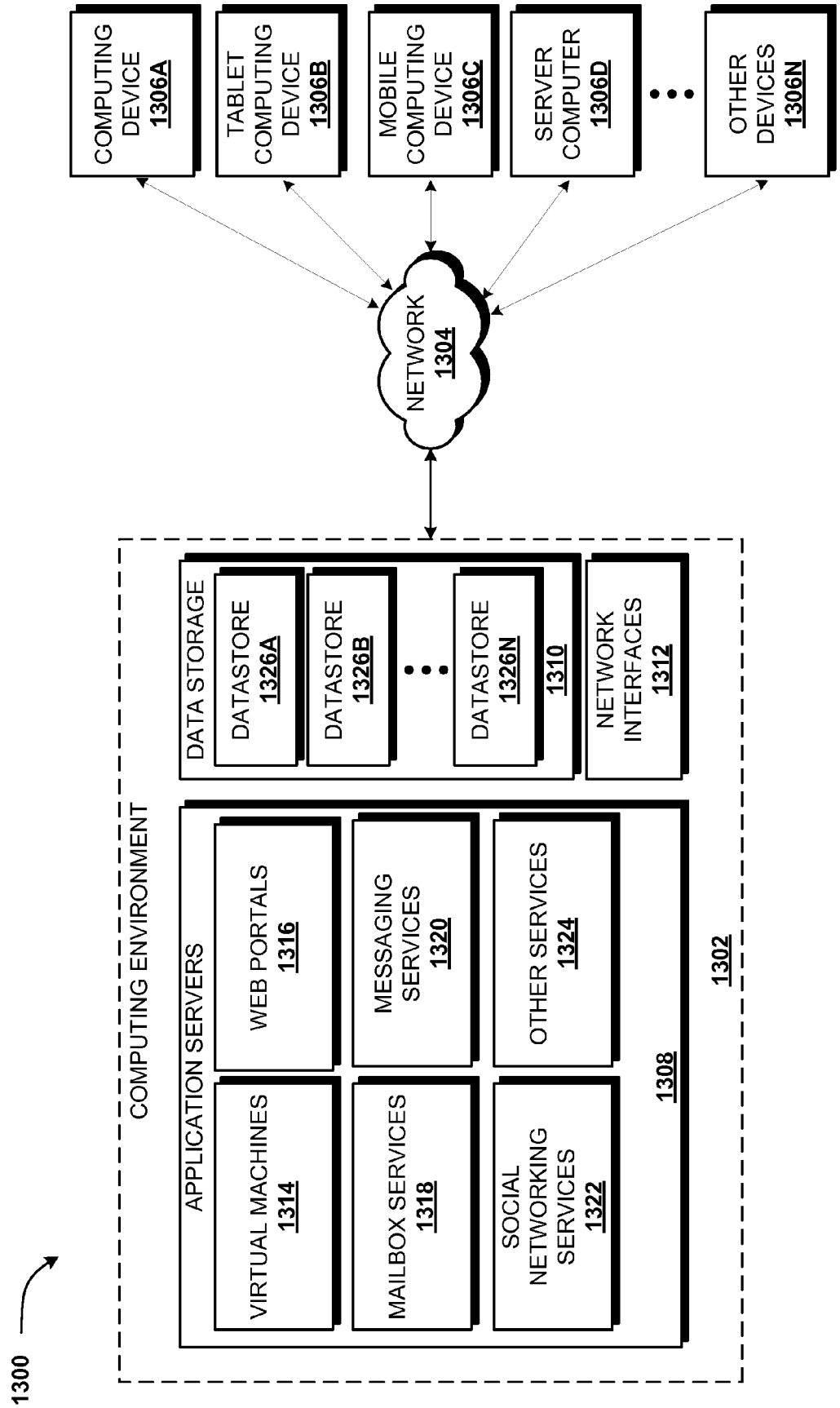
1300
COMPUTING ENVIRONMENT
1302
APPLICATION SERVERS
1308
VIRTUAL MACHINES 1314
WEB PORTALS 1316
MAILBOX SERVICES 1318
MESSAGING SERVICES 1320
SOCIAL NETWORKING SERVICES 1322
OTHER SERVICES 1324
DATA STORAGE
1310
DATASTORE 1326A
DATASTORE 1326B
DATASTORE 1326N
NETWORK INTERFACES 1312
NETWORK 1304
COMPUTING DEVICE 1306A
TABLET COMPUTING DEVICE 1306B
MOBILE COMPUTING DEVICE 1306C
SERVER COMPUTER 1306D
OTHER DEVICES 1306N

FIG. 13

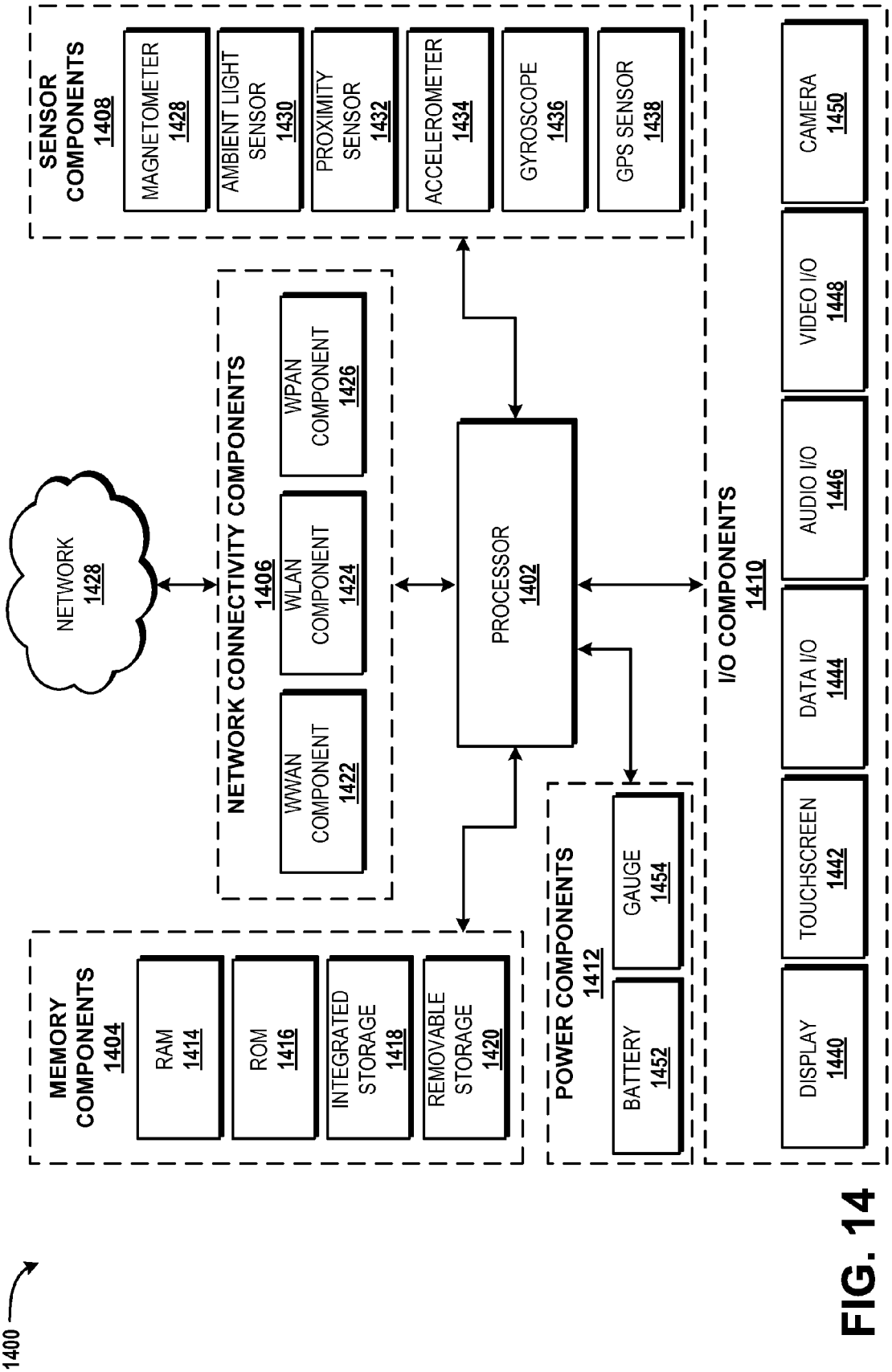
1400
SENSOR COMPONENTS 1408
MAGNETOMETER 1428
AMBIENT LIGHT SENSOR 1430
PROXIMITY SENSOR 1432
ACCELEROMETER 1434
GYROSCOPE 1436
GPS SENSOR 1438
NETWORK 1428
NETWORK CONNECTIVITY COMPONENTS 1406
WWAN COMPONENT 1422
WLAN COMPONENT 1424
WPAN COMPONENT 1426
PROCESSOR 1402
MEMORY COMPONENTS 1404
RAM 1414
ROM 1416
INTEGRATED STORAGE 1418
REMOVABLE STORAGE 1420
POWER COMPONENTS 1412
BATTERY 1452
GAUGE 1454
I/O COMPONENTS 1410
DISPLAY 1440
TOUCHSCREEN 1442
DATA I/O 1444
AUDIO I/O 1446
VIDEO I/O 1448
CAMERA 1450

FIG. 14

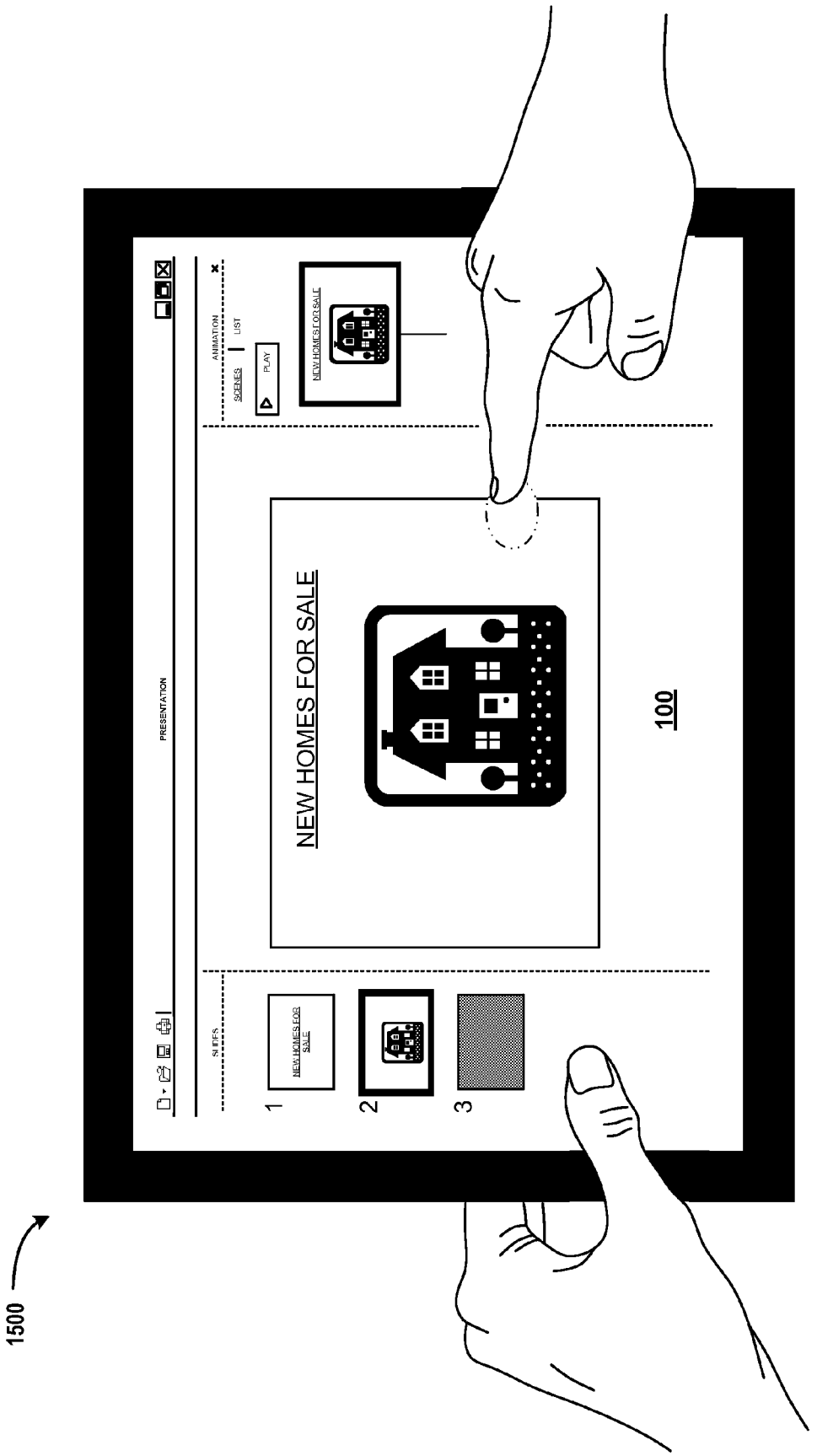
1500
PRESENTATION
SLIDES
1
NEW HOMES FOR SALE
2
3
NEW HOMES FOR SALE
100
ANIMATION
SCENES
LIST
PLAY
NEW HOMES FOR SALE

FIG. 15

ANIMATION CREATION AND MANAGEMENT IN PRESENTATION APPLICATION PROGRAMS

CROSS REFERENCE TO RELATED APPLICATIONS

This patent application is a continuation of co-pending U.S. patent application Ser. No. 13/295,110, entitled "Animation Creation and Management in Presentation Application Programs," filed, Nov. 14, 2011, which is herein incorporated by reference in its entirety.

BACKGROUND

Presentation application programs, such as MICROSOFT POWERPOINT, available from Microsoft of Redmond, Wash., allow users to create individual pages or "slides" for presentation in the form of a slide show. Each slide may contain text, graphics, sound, videos, and other objects. Animations may be applied to certain objects in a slide, such as text and graphics, to enhance the slide show.

Currently, MICROSOFT POWERPOINT's animation user interface ("UI") requires users to select an object, apply an animation primitive, and then adjust settings through a series of drop-down menus, spinners, and dialogs. Animation triggers include "On click", in which an animation effect is applied upon the click of the slide; "With previous", in which an animation effect is played at the same time as the previous item in the animation list or on load of the slide if the effect is first in the animation list; and "After previous", in which an animation effect is played immediately following the previous item in the animation list. Navigating the current MICROSOFT POWERPOINT user interface may be cumbersome to use for some users, and may prevent others from taking advantage of the animation features included in the program.

One particular type of animation effect is a motion path animation effect. When a user wants to animate an object utilizing a motion path animation effect, the user must provide an initial state for the object, a final state for the object, and define a type of path along which the object will move when the motion path animation effect is executed. The type of motion path may be a pre-defined motion path or a custom motion path. If the motion path is a straight line, the initial state or the end state can be easily adjusted by simply redrawing the line in between the two states. If the motion path is curved, however, then additional logic that is needed to properly scale the motion path to maintain the motion path itself. Moreover, when manipulating a motion path, it is helpful to know the end state of the motion path animation effect to allow for confident re-positioning of the end state.

It is with respect to these and other considerations that the disclosure made herein is presented.

SUMMARY

Concepts and technologies are described herein for creating and managing animations in a presentation application program. In accordance with the concepts and technologies disclosed herein, an animation timeline is analyzed to determine one or more discrete states. Each discrete state includes one or more animation effects. The discrete states represent scenes of a slide in a slide presentation. The concepts of scenes allows user to view a timeline of scenes, open a scene, and direct manipulate objects in the scene to author animations. The animations can include motion path animation effects, which can be directly manipulated utilizing a motion path tweening method. To aid in direct manipulation of a motion path of an object, a ghost version of the object can be shown to communicate to a user the position of the object after a motion path animation effect that includes the motion path is performed. The ghost version may also be used to show a start position when a start point is manipulated.

According to one aspect disclosed herein, a computer-readable storage medium includes computer-executable instructions that, when executed by a computer, cause the computer to present an animation pane on a display connected to the computer. The animation pane includes a scenes view and a list view. The scenes view of the animation pane includes a transparent scene thumbnail that, upon selection, opens a temporary new scene. The list view includes an animation timeline. The instructions also cause the computer to receive a selection of the transparent scene thumbnail from the scenes view, open the temporary new scene, receive a user input including a new animation effect in the temporary new scene, and create a new discrete state in the animation timeline. The new discrete state includes the new animation effect. The instructions also cause the computer to create a new scene from the temporary new scene. The new scene includes the new animation effect. The new scene includes a visualization for the new discrete state. The instructions also cause the computer to create a new scene thumbnail, create a new transparent scene thumbnail, and present, on the display, the new scene thumbnail and the new transparent scene thumbnail in the scenes view of the animation pane.

According to another aspect disclosed herein, a method for generating discrete states of an animation timeline includes analyzing, by a presentation application program executing on a computer, a plurality of animation effects in an animation timeline to determine one or more discrete states to be generated for the animation timeline, and generating, by the presentation application program executing on the computer, the one or more of discrete states for the animation timeline, wherein each of the one or more states includes one or more of the plurality of animation effects. In some embodiments, the analyzing operation of the method includes analyzing the plurality of animation effects in the animation timeline to determine which of the plurality of animation effects in the animation timeline are triggered by a user-controlled trigger, such as, but not limited to an on mouse click trigger, or a pre-configured trigger, such as, but not limited to, an after previous trigger. An animation effect that is triggered by the after previous trigger or the on mouse click trigger indicates a start of one of the one or more discrete states.

According to yet another aspect disclosed herein, a computer-implemented method for defining animations includes receiving, via a presentation application program executing on a computer, an input of a motion path animation effect for an object. The motion path animation effect includes a start point for the object, an end point for the object, and a motion path between the start point and the end point. The method further includes receiving, via the presentation application program executing on the computer, an input of a new start point and a new end point for the object, and scaling, via the presentation application program executing on the computer, the motion path of the motion path animation effect to fit between the new start point and the new end point for the object.

According to yet another aspect disclosed herein, a computer-readable storage medium includes computer-executable instructions that, when executed by a computer, cause the computer to present, on a display that is in communication with the computer, a canvas and an object on the canvas. The

instructions also cause the computer to receive a motion path animation effect for the object. The motion path animation effect includes a start point, an end point, and a motion path between the start point and the end point. The instructions also cause the computer to generate a ghost version of the object, and present, on the display, the object, the ghost version of the object, the start point, the end point, and the motion path on the canvas. The ghost version of the object is presented in proximity to the end point, and the ghost version of the object represents the object after the motion path animation effect has been performed.

It should be appreciated that the above-described subject matter may be implemented as a computer-controlled apparatus, a computer process, a computing system, or as an article of manufacture such as a computer-readable storage medium. These and various other features will be apparent from a reading of the following Detailed Description and a review of the associated drawings.

This Summary is provided to introduce a selection of concepts in a simplified form that are further described below in the Detailed Description. This Summary is not intended to identify key features or essential features of the claimed subject matter, nor is it intended that this Summary be used to limit the scope of the claimed subject matter. Furthermore, the claimed subject matter is not limited to implementations that solve any or all disadvantages noted in any part of this disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGS. **1-2** are a user interface diagrams illustrating aspects of an exemplary operating environment for various concepts disclosed herein.

FIG. **3** is a diagram illustrating aspects of an animation timeline before and after a scene analysis is performed, according to an illustrative embodiment.

FIGS. **4**A-**4**B are user interface diagrams of an animation pane illustrating aspects of a mechanism for adding a new scene to a slide, according to an illustrative embodiment.

FIGS. **5**A-**5**B are user interface diagrams of an animation pane illustrating aspects of a mechanism for deleting a scene from a slide, according to an illustrative embodiment.

FIG. **6** is a flow diagram illustrating aspects of a method for applying changes to a scene, according to an illustrative embodiment.

FIG. **7** is a diagram illustrating a visualization of a motion path tweening method, according to an illustrative embodiment.

FIG. **8** is a flow diagram illustrating aspects of a method for motion path tweening, according to an illustrative embodiment.

FIG. **9** is a flow diagram illustrating a scaling subprocess performed during an operation of the method described in FIG. **8**, according to an illustrative embodiment.

FIG. **10** is a diagram illustrating a motion path after the method described in FIG. **8** and the subprocess described in FIG. **9** have been performed and a mechanism for adjusting a height of the motion path, according to an illustrative embodiment.

FIG. **11** is a diagram illustrating a mechanism for motion path visibility when directly manipulating objects on a slide canvas, according to an illustrative embodiment.

FIG. **12** is a computer architecture diagram illustrating an illustrative computer hardware and software architecture for a computing system capable of implementing aspects of the embodiments presented herein.

FIG. **13** is a diagram illustrating a distributed computing environment capable of implementing aspects of the embodiments presented herein.

FIG. **14** is a computer architecture diagram illustrating a computing device architecture capable of implementing aspects of the embodiments presented herein.

FIG. **15** is a diagram illustrating an exemplary tablet device with a user interface diagram being shown on a display of the tablet device in a landscape mode, according to an illustrative embodiment.

DETAILED DESCRIPTION

The following detailed description is directed to concepts and technologies for creating and managing animations in presentation application programs. According to the concepts and technologies described herein an animation timeline is analyzed to determine one or more discrete states. Each discrete state includes one or more animation effects. The discrete states represent scenes of a slide in a slide presentation. The concepts of scenes allows user to view a timeline of scenes, open a scene, and direct manipulate objects in the scene to author animations. The animations can include motion path animation effects, which can be directly manipulated utilizing a motion path tweening method. To aid in direct manipulation of a motion path of an object, a ghost version of the object can be shown to communicate to a user the position of the object after a motion path animation effect that includes the motion path is performed. The ghost version may also be used to show a start position when a start point is manipulated.

While the subject matter described herein is presented in the general context of program modules that execute in conjunction with the execution of an operating system and application programs on a computer system, those skilled in the art will recognize that other implementations may be performed in combination with other types of program modules. Generally, program modules include routines, programs, components, data structures, and other types of structures that perform particular tasks or implement particular abstract data types. Moreover, those skilled in the art will appreciate that the subject matter described herein may be practiced with other computer system configurations, including hand-held devices, multiprocessor systems, microprocessor-based or programmable consumer electronics, minicomputers, mainframe computers, and the like.

In the following detailed description, references are made to the accompanying drawings that form a part hereof, and in which are shown by way of illustration specific embodiments or examples. Referring now to the drawings, in which like numerals represent like elements throughout the several figures, aspects of a computing system, computer-readable storage medium, and computer-implemented methodology for creating and managing animations in presentation application programs will be presented.

FIG. **1** is a user interface diagram illustrating aspects of an exemplary operating environment for various concepts disclosed herein. In particular, FIG. **1** shows an illustrative user interface **100** provided by a presentation application program according to one implementation disclosed herein. As will be described in greater detail below, the user interface **100** is utilized, in part, to author animations for objects, such as shapes, graphics, pictures, text, audio, video, charts, graphs, and like objects, to view the animations in one or more scenes of an animation sequence, and to manage the scenes.

In the illustrated embodiment, the user interface **100** includes a layout area **102**, a slide selection pane **104**, and an animation pane **106**. The configuration of the layout area **102**,

the slide selection pane **104**, and the animation pane **106** is illustrative and is not intended to be limiting in any way. The layout area **102** is utilized to create a layout of one or more objects on a slide canvas **108** and to directly manipulate one or more of the objects to author animations to create scenes for one or more slides of a slide presentation.

The slide selection pane **104** is utilized to show slide thumbnails for each slide that has been created in the active slide presentation. These are generally shown slide thumbnails **110**. In the illustrated embodiment, the slide selection pane **104** includes a first slide thumbnail **112** for a first slide and a second slide thumbnail **114** for a second slide. The second slide thumbnail has been selected and, as a result, the content of the second slide displayed in the slide area **102** on the slide canvas **108**. As illustrated, the second slide includes a title object **118** and a picture object **120**.

As new slides are added to the presentation or as existing slides are deleted from the presentation, slide thumbnails **110** are respectively added to or deleted from the slide selection pane **104**. A new slide may be added to the presentation by selecting a grayed-out slide thumbnail **122** in the slide selection pane **104**. Additionally or alternatively, a new slide may be added through a user interface object, such as a user interface icon or user interface menu that is always visible or that is made visible as a result of some user input, such as a mouse click, touch input, or voice input.

Each slide in a presentation may include an animation sequence for animations of the objects within the slide. The animation sequence is represented in the animation pane **106** in either a scenes view **124** or a list view **126**. The list view **126** includes an animation timeline depicting each animation of the animation sequence for the selected slide. An illustrative list view is described in greater detail below with reference to FIG. **2**. An illustrative animation timeline is described in greater detail below with reference to FIG. **3**.

The scenes view **124** includes one or more scenes depicted as scene thumbnails in a timeline of scenes **128**. A scene is a discrete state in an animation timeline. The scene thumbnails may appear like the slide thumbnails **110**, but are representative of scenes within the selected slide thumbnail. For example, in the illustrated embodiment, a first scene represented in the time line of scenes **128** as a first scene thumbnail **130** has been selected and, accordingly, the title object **118** and the picture object **120** are displayed in the slide area **102** on the slide canvas **108**. If a second scene thumbnail **132** is selected, the layout included in a second scene of the selected slide is displayed in the slide area **102** on the slide canvas **108** and so on. The selected scene may then be edited by adding or deleting objects, manipulating objects, adding or deleting animations, manipulating animations, and so on.

An animation of an object that begins with an "On Mouse Click" triggeror an "After Previous" trigger is identified as the start of a new scene. The "On Mouse Click" causes an animation to begin on click of a mouse. Other inputs such as touch or voice inputs may be used as alternative triggers for such functionality. The "After Previous" trigger causes an animation to begin immediately after the previous item in the animation timeline if the previous item is finished playing. That is, no additional click or other input is needed trigger the next animation to start. Additionally, the first animation in the animation timeline may be the start of a new scene.

Although an "On Mouse Click" trigger is described above, other exemplary user-controlled triggers that may be used to denote the start of a new scene are contemplated. Moreover, although an "After Previous" trigger is described above, other exemplary pre-configured triggers that may be used to denote the start of a new scene are contemplated. As such, the uses of an "On Mouse Click" trigger and an "After Previous" trigger herein are intended to be illustrative and should not be interpreted as being limiting.

In the illustrated embodiment, the scenes view **124** and the list view **126** are selectable via tabs within the animation pane **106**. It should be understood that other configurations are possible including, but not limited to, dedicated animation panes for each view. As such, the illustrated embodiment should not be interpreted as being limiting in any way.

Each scene thumbnail in the timeline of scenes **128** may be associated with a scene number **134**, as in the illustrated embodiment. Moreover, each scene thumbnail in the timeline of scenes **128** may include an icon or other visual representation of the type of trigger that causes the scene to be played. In the illustrated embodiment, a mouse icon **136** is shown adjacent to the second scene thumbnail to indicate that the second scene thumbnail **132** is triggered by an "On Mouse Click" trigger. As will be shown in FIG. **3**, a clock icon may be used to indicate that a particular scene is triggered by an "After Previous" trigger. This icon or any other such icon may be relegated to the animation timeline in the list view **126**, may be included in the scenes view **124** and the list view **126**, or may not be displayed at all. These icons are merely illustrative and should not be interpreted as being limiting in any way.

The illustrated timeline of scenes **128** includes a line **138** to the next scene to represent linearity between the scenes. The line **138** extends through each scene thumbnail in the timeline of scenes **128** and ends at a transparent scene thumbnail **140**. Selection of the transparent scene thumbnail **140** causes a temporary new scene (not shown) to be shown on the slide canvas **108**. After an animation is received within the temporary new scene, the temporary new scene becomes a new scene. The new scene is then added to the animation timeline of the list view **126** as a new discrete state, and a new scene thumbnail (not shown) is added to the scenes view **124**. Another transparent scene thumbnail like the transparent scent thumbnail **140** then may be added to the timeline of scenes **128**.

Although only a layout area **102**, a slide selection pane **104**, and an animation pane **106** have been described, one or more additional areas, panes, or other user interface spaces may be provided in the user interface **100** concurrently with the above or in various different interactive states of the user interface **100**. For instance, additional areas, panes, or other spaces might also be provided for displaying user interface icons or other types of user interface objects for initiating some of the functionality described herein and other functions including, but not limited to, other functions of presentation application programs such as MICROSOFT POWERPOINT, available from MICROSOFT CORPORATION of Redmond, Wash., and other functions not disclosed herein.

In this regard, it should be appreciated that the user interface **100** and the remainder of the user interfaces disclosed herein have been greatly simplified for purposes of discussion. The user interfaces described herein might include more or fewer components, might be arranged differently, and might operate in a different fashion while still remaining within the scope of the disclosure provided herein. It should also be appreciated that while various user input devices will be described with respect to the various embodiments disclosed herein, other types of user input mechanisms might also be utilized. For instance, although the various embodiments described herein are disclosed in conjunction with the use of a mouse user input device controlling a mouse cursor, other types of user input devices and mechanisms such as

keyboards, touch screens, proximity sensors, accelerometers, voice input, and others may be utilized.

FIG. **2** is a user interface diagram of the user interface **100** illustrating additional aspects of an exemplary operating environment for various concepts disclosed herein. In the illustrated embodiment, the list view **126** has been selected in the animation pane **106**. The list view **126** includes an animation timeline **200**. The animation timeline **200** includes a list of animations and the objects to which the animations have been applied. The animation timeline **200** may also include a scene number **202** to indicate the scene to which each animation or group of animations is associated, as in the illustrated embodiment. As also shown in the illustrated embodiment, each animation in the animation timeline **200** may include an animation icon **204** to indicate a type of animation effect or a category of animation effects currently associated with the object referenced in an object description **206**.

Illustrative categories of animation effects include, but are not limited to, entrance animation effects, exit animation effects, emphasis animation effects, and motion path animation effects. Illustrative entrance animation effect include, but are not limited to, appear effect, fade effect, fly in, float in, split, wipe, shape, wheel, random bars, grow and turn, zoom, swivel, and bounce. Illustrative exit animation effects include, but are not limited to, disappear, fade, fly out, float out, split, wipe, shape, wheel, random bars, shrink and turn, zoom, swivel, and bounce. Illustrative emphasis effects include, but are not limited to, pulse, color pulse, teeter, spin, grow, shrink, desaturate, darken, lighten, transparency, object color, complementary color, line color, brush color, font color, underline, bold flash, bold reveal, and wave. Illustrative motion path effects include, but are not limited to, lines, arcs, turns, shapes, loops, and custom paths.

In the illustrated embodiment, a second scene has been selected and is shown on the slide canvas **108**. The second scene includes the title object **118**, the picture object **120**, and a text box object **208**. The second scene is shown as being triggered by an "On Mouse Click" trigger, as indicated by the mouse icon **136**.

The illustrated animation timeline **200** includes an animation effect for the picture object **120** and an animation for the text box **208**. In particular, a motion path animation effect has been applied to the picture object **120**, as indicated by an illustrative motion path icon **210**, and an appear entrance effect has been applied to the text box object **208**, as indicated by an illustrative appear icon **212**. The motion path animation effect causes the picture object **120** to move from the center of the slide canvas **108** to the right side of the slide canvas **108**. The motion path along which the picture object **120** moves to reach the end point at the right side of the slide canvas **108** may be directly manipulated to create a custom motion path, as will be described in greater detail below. The appear entrance effect causes the text box object **208** to appear on the slide canvas **108**. It should be understood that these particular animation effects are merely illustrative and are not intended to be limiting in any way. It also should be understood that additional animations may be applied to each object, such as is the case illustrated for the picture object **120** in the first scene.

FIG. **3** is a diagram illustrating aspects of an animation timeline before and after a scene analysis is performed, according to an illustrative embodiment. The animation timeline before the scene analysis is performed is illustrated as a before state **300**. The animation timeline after the scene analysis is performed is illustrated as an after state **302**. It should be understood that the contents of the animation timeline in the before state **300** and the after state **302** are merely illustrative and are not intended to be limiting in any way. In some embodiments, only the after state **302** is shown in the list view **126** of the animation pane **106**. As such, the before state **300** is shown to demonstrate how the presentation application program analyzes a plurality of animation effects in an animation timeline to determine one or more discrete states that are to be generated for the timeline and shown in the scene view **124** of the animation pane **106** as one or more selectable scene thumbnails.

The illustrated before state **300** of the animation timeline includes a plurality of animation effects, shown generally as animation effects **304**. Each of the animation effects **304** includes an animation icon, shown representatively as an animation icon **306** for a first animation effect of the animation effects **304**. Each of the animation effects **304** also includes an object description, shown representatively as an object description **308**.

The animation effects **304** are divided into one or more scenes. As mentioned above, a scene is a discrete state in the animation timeline. The first animation in any given discrete state is an animation that is triggered by an "On Mouse Click" trigger or an "After Previous" trigger. The first animation in the animation timeline also indicates the beginning of a first scene.

In the illustrated embodiment, the animation effects **304** are divided into six scenes **310**A-**310**F. The first scene **310**A begins with an animation effect that is to be applied to OBJECT **1** and ends with an animation effect that is to be applied to OBJECT **4**. The first scene **310**A is demarcated from the second scene **310**B by an animation effect that is to be applied to OBJECT **5** and that is triggered by an "After Previous" trigger, as indicated by an illustrative clock icon **312**. The third scene **310**C is demarcated from the second scene **310**B by an animation effect that is to be applied to OBJECT **6** and that is triggered by an "After Previous" trigger, as also indicated by a clock icon **312**. Similarly, the fourth scene **310**D is demarcated from the third scene **310**C by an animation effect that is to be applied to OBJECT **7** and that is triggered by an "After Previous" trigger, as also indicated by a clock icon **312**. The fifth scene **310**E is demarcated from the fourth scene **310**D by an animation effect that is to be applied to OBJECT **8** and that is triggered by an "On Mouse Click" trigger, as indicated by a mouse icon **314**. Similarly, the sixth scene **310**F is demarcated from the fifth scene **310**E by an animation effect that is to be applied to OBJECT **5** and that is triggered by an "On Mouse Click" trigger, as also indicated by a mouse icon **314**.

In the before state **300** of the animation timeline, the first animation and each animation that is associated with either an "After Previous" trigger or an "On Mouse Click" trigger are numbered. In the after state **302** of the animation timeline, each of the six scenes **310**A-**310**F is numbered. In other words, animation numbering in the before state **300** of the animation timeline user input, such as starting a slide in a slide show or an "On Mouse Click" trigger, but animation numbering in the after state **302** is based upon to which scene each animation belongs. The after state **302** of the animation timeline is made viewable in the scenes view **126** after the scene analysis.

FIGS. **4**A-**4**B are user interface diagrams of the animation pane **106** illustrating aspects of a mechanism for adding a new scene to a slide, according to an illustrative embodiment. FIG. **4**A illustrates the animation pane **106** in the scenes view **124** and FIG. **4**B illustrates the animation pane **106** in the list view **126**. FIG. **4**A will now be described.

FIG. **4**A illustrates a first state **400** of the animation pane **106**, a second state **402** of the animation pane **106**, and a third

state **404** of the animation pane **106**. The first state **400** of the animation pane **106** shows a transparent scene thumbnail **140**. When the transparent scene thumbnail **140** is selected, as shown in the second state **402** of the animation pane **106**, a temporary new scene (not shown) is created. The temporary new scene is displayed on the slide canvas **108**. After an object and/or animation are added to the temporary new scene, the temporary new scene becomes a new scene, which is represented in the third state **404** of the animation pane **106** as a new scene thumbnail **406**. A new transparent scene thumbnail **408** may be created and positioned after the new scene thumbnail **406**, as in the illustrated embodiment. The new transparent scene thumbnail **408** functions like the transparent scene thumbnail **140**.

FIG. **4**B illustrates the first state **400** of the animation pane **106** and the third state **406** of the animation pane **106** when the animation pane **106** is in the list view **126**. The first state **400** of the animation pane **106** in the list view **126** is empty to reflect that no scenes exist. It is contemplated, however, that a user interface object (not shown) may be made available to facilitate creation of a new scene within the list view **126**. The third state **406** of the animation pane **106** in the list view **126** shows a new scene animation list **410** including the animation effects applied during the new scene represented as the new scene thumbnail **406** in the scenes view **124** of FIG. **4**A. The second state **404** is not illustrated in FIG. **4**B since the new scene animation list **410** does not exist until a new scene is created after an object and/or animation are added to the temporary new scene.

FIGS. **5**A-**5**B are user interface diagrams of the animation pane **106** illustrating aspects of a mechanism for deleting a scene from a slide, according to an illustrative embodiment. FIG. **5**A illustrates the animation pane **106** in the scenes view **124** and FIG. **5**B illustrates the animation pane **106** in the list view **126**. FIG. **5**A will now be described.

FIG. **5**A illustrates a first state **500** of the animation pane **106**, a second state **502** of the animation pane **106**, and a third state **504** of the animation pane **106**. The first state **500** of the animation pane **106** shows a first scene thumbnail **506**, a second scene thumbnail **508**, and a transparent scene thumbnail **140**. In the illustrated first state **500**, the second scene thumbnail **508** has been selected for deletion. The second scene thumbnail **508** is then deleted from the scenes view **124** of the animation pane **106** in response a delete input received via a delete key of a keyboard, a delete software button (not shown) available within the animation pane **106** or elsewhere within the user interface **100**, or in response to some other input such as a touch gesture or voice input. After the second scene thumbnail **508** has been deleted, the animation pane **106** is in the second state **502**.

The second state **502** of the animation pane **106** shows the first scene thumbnail **506** and the transparent scene thumbnail **140**. In the illustrated second state **502**, the first scene thumbnail **506** has been selected for deletion. The first scene thumbnail **506** is then deleted from the scenes view **124** of the animation pane **106** in response a delete input received in a manner such as described above. After the first scene thumbnail **506** has been deleted, the animation pane **106** is in the third state **504**. The third state **506** of the animation pane **106** shows the transparent scene thumbnail **140**.

FIG. **5**B illustrates the first state **500** of the animation pane **106**, the second state **502** of the animation pane **106**, and the third state **504** of the animation pane **106** when the animation pane **106** is in the list view **126**. The first state **500** of the animation pane **106** in the list view **126** shows a first scene animation list **510** and a second scene animation list **512**. The first scene animation list **510** includes the animation effects applied during a first scene of a slide. The second scene animation list **512** includes the animation effect applied during a second scene of the slide.

In the illustrated first state **500**, the second scene animation list **512** has been selected for deletion. The second scene animation list **512** is then deleted from the list view **126** of the animation pane **106** in response a delete input received in a manner such as described above. After the second scene animation list **512** has been deleted, the animation pane **106** is in the second state **502**.

The second state **502** of the animation pane in the list view **126** shows the first scene animation list **510**. The first scene animation list **510** has been selected for deletion. After the first scene animation list **510** has been deleted, the animation pane **106** is in the third state **502**. The third state **504** of the animation pane **106** in the list view **126** is empty to reflect that no scenes exist.

In some cases, it may be desirable to delete a scene that is positioned between two scenes. In these cases, after a scene that is positioned between two scenes is deleted, the initial state of all objects within the next scene after the deleted scene are applied to the final state of all objects within the scene positioned before the deleted scene to maintain continuity between the scene positioned before the deleted scene and the scene positioned after the deleted scene.

Scenes may be reordered in the scenes view **124** or the list view **126** in the animation pane. To reorder a scene, a scene thumbnail or a scene animation list is selected and moved to a new location within the animation pane **106**. The presentation application program is configured to update all scenes from the start range to the end range of the position change.

After a scene is opened, objects on the slide canvas **108** that are associated with that scene can be directly manipulated. In some embodiments, any changes that are made to the objects are encoded as animations in that scene. Alternatively or additionally, animations may be inserted.

FIG. **6** is a flow diagram illustrating aspects of a method **600** for applying changes to a scene, according to an illustrative embodiment. It should be understood that the operations of the methods disclosed herein are not necessarily presented in any particular order and that performance of some or all of the operations in an alternative order(s) is possible and is contemplated. The operations have been presented in the demonstrated order for ease of description and illustration. Operations may be added, omitted, and/or performed simultaneously, without departing from the scope of the appended claims.

It also should be understood that the illustrated methods can be ended at any time and need not be performed in its entirety. Some or all operations of the methods, and/or substantially equivalent operations, can be performed by execution of computer-readable instructions included on a computer-storage media, as defined below. The term "computer-readable instructions," and variants thereof, as used in the description and claims, is used expansively herein to include routines, applications, application modules, program modules, programs, components, data structures, algorithms, and the like. Computer-readable instructions can be implemented on various system configurations, including single-processor or multiprocessor systems, minicomputers, mainframe computers, personal computers, hand-held computing devices, microprocessor-based, programmable consumer electronics, combinations thereof, and the like.

Thus, it should be appreciated that the logical operations described herein are implemented (1) as a sequence of computer implemented acts or program modules running on a computing system and/or (2) as interconnected machine logic

circuits or circuit modules within the computing system. The implementation is a matter of choice dependent on the performance and other requirements of the computing system. Accordingly, the logical operations described herein are referred to variously as states, operations, structural devices, acts, or modules. These operations, structural devices, acts, and modules may be implemented in software, in firmware, in special purpose digital logic, and any combination thereof.

In some embodiments, animating a property in a scene propagates the change to the scenes positioned after that scene. In these embodiments, however, any property in a scene that has been edited may be absolute, meaning changes to the previous scenes do not affect that scene. For example, changing the size of an object in a second scene does not affect the same object in the third scene if that same object has had the size property changed in the third scene. However, if the third scene does not have an animation for position, changing the position of the object in the second scene does affect the third scene.

When a property is manipulated in a scene, the presentation application program either adds or modifies an animation to apply the animation effect associated with that animation. The method **600** provides an illustrative example of this logic.

The method **600** begins and proceeds to operation **602**, wherein it is determined if a property has changed in a current scene or if a property has changed in a previous scene. If it is determined, at operation **602**, that a property has changed in the current scene or a property has changed in the previous scene, the method **600** proceeds to operation **604**. At operation **604**, it is then determined if the property animation primitive exists in the current scene. If it is determined, at operation **604**, that the property animation primitive exists in the current scene, the method **600** proceeds to operation **606**. At operation **606**, the first and last such animation primitive is selected and modified according to the change that was determined to have occurred in operation **602**. The method **600** then proceeds to operation **608**, wherein the method **600** ends.

If it is determined, at operation **604**, that the property animation primitive does not exist in the current scene, the method **600** proceeds to operation **610**. At operation **610**, the appropriate animation primitive is added to the end of the current scene. The method **600** then proceeds to operation **606**. At operation **606**, the first and last such animation primitive is selected and modified according to the change that was determined to have occurred in operation **602**. The method **600** then proceeds to operation **608**, wherein the method **600** ends.

If it is determined, at operation **602**, that a property has not changed in the current scene and a property has not changed in the previous scene, the method **600** proceeds to operation **608**. The method **600** ends at operation **608**.

FIG. **7** is a diagram illustrating a visualization **700** of a motion path tweening method, according to an illustrative embodiment. An illustrative method for motion path tweening is described below with reference to FIGS. **8** and **9**. The visualization **700** includes the motion path **702**, a bounding box **704** encompassing the motion path **702**, a start point **706** of the motion path **702**, an end point **708** of the motion path **702**, a point (Cx, Cy) **710**, a direction arrow **712**, a vertical reference **714**, an intermediate end point **716** of the motion path **702**, and a final end point **718** of the motion path **702**. The motion path **702** may be a non-linear motion path selected from a set of pre-defined motion paths for a motion path animation effect or a custom motion path created by a user.

The bounding box **704** includes a SetBoundRotate(angle) property defining an angle of rotation around the point (Cx, Cy) **710**, a SetBoundPosition(x, y) defining x and y coordinates of the point (Cx, Cy) **710** on the slide canvas **108**, and a SetBoundSize(width, height) defining a width and height of the bounding box **704**. More generally, the bounding box **704** includes a bound rotation property defining an angle of rotation around a point along the edge of the bounding box **704**, a bound position property defining an x coordinate and a y coordinate of the point, and a bound size property defining the size of the bounding box in width and height components.

The start point **706** is the starting position of an object to which a motion path animation effect including the motion path **702** has been applied. The start point **706** may be manipulated by a user, but in the illustrated embodiment remains in line with the vertical reference **714**. The end point **708** is the ending position of the object. The point (Cx, Cy) **710** is a point of reference for various operations performed by the motion path tweening method described below. The direction arrow **712** indicates the direction towards the final end point **718** of the motion path **702**. In the illustrated embodiment, the final end point **718** has been selected by a user and the motion path **702** is to be scaled to accommodate the final end point **718** while maintaining the shape of the motion path **702**. A method **800** for motion path tweening to accomplish the above will now be described with reference to FIG. **8** and additional reference to FIG. **7**.

The method **800** begins and proceeds to operation **802**, wherein the slide canvas **108** is presented in the user interface **100** of the presentation application program. From operation **802**, the method **800** proceeds to operation **804**, wherein an input of an object is received on the slide canvas **108**. From operation **804**, the method **800** proceeds to operation **806**, wherein an input of a motion path animation effect is received for the object.

In some embodiments, a visual representation of the motion path animation effect is shown on the slide canvas **108**. The visual representation of the motion path animation effect includes a start point, a motion path, and an end point. For purposes of description, the motion path received in operation **806** will be described as the motion path **702** of FIG. **7**. Accordingly, the start point and the end point of the motion path will be referred to as the start point **706** and the end point **708**, respectively, of the motion path **702**.

From operation **806**, the method proceeds to operation **808**, wherein a new end point is received for the object. The new end point may be received through a direct manipulation of the motion path **702** such that the end point **708** of the motion path **702** is moved to the final end point **718**. In some embodiments, a new start point is additionally or alternatively received for the object. From operation **808**, the method **800** proceeds to operation **810**, wherein the motion path **702** is scaled to fit between the start point **706** and the final end point **718**. The operation **810** is further described below with reference to a scaling subprocess **900** of FIG. **9**. From operation **810**, the method **800** proceeds to operation **812**, wherein the method **800** ends.

FIG. **9** is a flow diagram illustrating the scaling subprocess **900** performed during operation **810** of the method **800** described above with reference to FIG. **8**. The subprocess **900** utilizes the following utility methods for various calculations. A RotateBounds(angle, point) method is used to rotates the bounding box **704** around the point. A ScaleBounds(factorX, factorY, point) method is used to scale the bounding box **704** relative to the point. A GetStart method is used to return the start point of the motion path **704** relative to the point (Cx, Cy) **710**. A GetEnd method is used to return the end point of the motion path **704** relative to the point (Cx, Cy) **712**. The subprocess **900** will now be described with additional refer-

ence to FIG. **7** and to these utility methods to fit the motion path **702** from the start point **706** to the final end point **718**.

The subprocess **900** begins and proceeds to operation **902**, wherein the bounding box **704** is associated with the motion path **702**. From operation **902**, the subprocess proceeds to operation **904**, the SetBoundPosition property is set. The SetBoundPosition property, as described above, includes x and y coordinates. At operation **904**, the SetBoundPosition property is provided as SetBoundPosition(newStart.x−GetStart.x, newStart.y−GetStart.y), wherein newStart.x is a x coordinate value of a start point set for the motion path **702** after a manipulation, GetStart.x is a x coordinate value of the start point **706** for the motion path **702** before the manipulation, newStart.y is a y coordinate value of a start point set for the motion path **702** after the manipulation, and GetStart.y is a y coordinate value of the start point **706** after the manipulation. In FIG. **7**, the start point **706** remains unchanged after a manipulation of the end point **708**. Accordingly, in the illustrated embodiment, the GetStart x and y coordinate value are the same as the newStart x and y coordinate values. In some embodiments, however, the newStart x and/or y coordinate values are changed after the manipulation, in which case the appropriate values would be populated for the newStart method. As noted above, the coordinate values for the GetStart and GetEnd methods are calculated relative to the point (Cx, Cy) **710**.

From operation **904**, the subprocess **900** proceeds to operation **906**, wherein a distance between the start point **706** and the end point **708** is calculated. This distance is referred to as the old distance, or oldDistance, which is defined as being equal to the distance between the value returned by the GetStart method and the GetEnd method. From operation **906**, the subprocess **900** proceeds to operation **908**, wherein a distance between the start point **706** and the final end point **718** is calculated. This distance is referred to as the new distance, or newDistance, which is defined as being equal to the distance between the value returned by the NewStart method and the NewEnd method.

From operation **908**, the subprocess **900** proceeds to operation **910**, wherein a distance quotient is calculated. The distance quotient is calculated as the newDistance divided by the oldDistance calculated, respectively, in operations **906** and **908**. From operation **910**, the method proceeds to operation **912**, wherein the width of the bounding box **704** is scaled relative to the value returned by the GetStart method, or, in other words, the start point **706** relative to the point (Cx, Cy) **710**. The width of the bounding box **704** is calculated utilizing the ScaleBounds method, wherein factorX is set to the distance quotient, factorY is set to 1.0, and the point is set to the value returned by the GetStart method.

From operation **912**, the subprocess **900** proceeds to operation **914**, wherein an angle between the start point **706** and the end point **708** is calculated. This angle is referred to as the old angle, or oldAngle, which is defined as being equal to the angle between the value returned by the GetStart method and the value returned by the GetEnd method. From operation **912**, the subprocess **900** proceeds to operation **916**, wherein an angle between the start point **706** and the final end point **718** is calculated. This angled is referred to as the new angle, or newAngle, which is defined as being equal to the angle between the value returned by the NewStart method and the value returned by the NewEnd method. From operation **916**, the subprocess **900** proceeds to operation **918**, wherein an angle quotient is calculated. The angle quotient is equal to the newAngle divided by the oldAngle.

From operation **916**, the subprocess **900** proceeds to operation **920**, wherein the RotateBounds method is utilized to rotate the bounding box **704** around the value returned by the GetStart method. The angle of rotation is calculated is set as the value returned in operation **918** for the angle quotient. From operation **920**, the subprocess **900** proceeds to operation **922**. The subprocess **900** ends at operation **922**.

FIG. **10** is a diagram illustrating the motion path **702** of FIG. **7** after the method **800** and the subprocess **900** of the method **900** have been performed. Upon selection of the motion path **702**, a height adjustment box **1000** is displayed. The height adjustment box **1000** facilitates manipulation of the height of the motion path **702** by height adjustment handles **1002**. Scaling the height of the motion path **702** causes an equally proportionate change of the top and bottom portions of the motion path **702** with respect to a line **1004** intersecting the start point **706** and the final end point **718**. This ensures the start point **706** and the final end point **718** of the motion path remain the same. FIG. **10** illustrates the height of the motion path **702** before adjustment, after the height of the motion path **702** is decreased, and after the height of the motion path **702** is increased.

FIG. **11** is a diagram illustrating a mechanism for motion path visibility when directly manipulating objects on a slide canvas, according to an illustrative embodiment. In the illustrated embodiment, an object **1100** is displayed on a slide canvas, such as the slide canvas **108** described above with reference to FIG. **1**. The object **1100** is associated with a motion path animation effect. The motion path animation effect includes a start point **1102**, an end point **1104**, and a motion path **1106**. The motion path **1106** is illustrated as being linear, but other motion path shapes are contemplated.

If the motion path animation effect is selected, for example, with a cursor **1108**, a ghost version **1110** of the object **1100** is generated and is shown on the slide canvas **108**. The ghost version **1110** represents where on the slide canvas **108** the object **1100** will appear when the motion path animation effect is performed. The end point **1104** may be dragged to a new position on the slide canvas **108**. The ghost version **1110** of the object **1100** is shown over the new position. If the new position is confirmed, for example, by releasing a mouse button or removing a finger from a touchscreen to end a drag gesture, the end point **1104** is repositioned at the new position and the ghost version **1110** is shown in the new position. The ghost version may also be used to show a start position when a start point is manipulated.

It should be understood that the ghost version **1110** of the object may be transparent, semi-transparent, colored, emphasized, deemphasized, or in some other way visually differentiated from the object **1100**. As such, the illustrated embodiment of a semi-transparent ghost version is not intended to be limiting in any way. It should also be understood that the ghost version **1110** need not be positioned such that the end point **1104** is in the center of the ghost version **1110** as in the illustrated embodiment. Instead, the ghost version **1110** may be in proximity to the end point **1104**. The ghost version **1110** being in proximity to the end point **1104** includes the ghost version **1110** at least partially intersecting the end point **1104** or being within a pre-defined distance from the end point **1104** such that it would be apparent to a user where the end position of the object **1100** would be after the motion path animation effect is performed.

FIG. **12** illustrates an illustrative computer architecture **1200** for a device capable of executing the software components described herein for creating and managing animations. Thus, the computer architecture **1200** illustrated in FIG. **12** illustrates an architecture for a server computer, mobile phone, a PDA, a smart phone, a desktop computer, a netbook computer, a tablet computer, and/or a laptop computer. The

computer architecture **1200** may be utilized to execute any aspects of the software components presented herein.

The computer architecture **1200** illustrated in FIG. **12** includes a central processing unit **1202** ("CPU"), a system memory **1204**, including a random access memory **1206** ("RAM") and a read-only memory ("ROM") **1208**, and a system bus **1210** that couples the memory **1204** to the CPU **1202**. A basic input/output system containing the basic routines that help to transfer information between elements within the computer architecture **1200**, such as during startup, is stored in the ROM **1208**. The computer architecture **1200** further includes a mass storage device **1212** for storing an operating system **1214** and one or more application programs including, but not limited to, a presentation application program **1216**.

The mass storage device **1212** is connected to the CPU **1202** through a mass storage controller (not shown) connected to the bus **1210**. The mass storage device **1212** and its associated computer-readable media provide non-volatile storage for the computer architecture **1200**. Although the description of computer-readable media contained herein refers to a mass storage device, such as a hard disk or CD-ROM drive, it should be appreciated by those skilled in the art that computer-readable media can be any available computer storage media or communication media that can be accessed by the computer architecture **1200**.

Communication media includes computer readable instructions, data structures, program modules, or other data in a modulated data signal such as a carrier wave or other transport mechanism and includes any delivery media. The term "modulated data signal" means a signal that has one or more of its characteristics changed or set in a manner as to encode information in the signal. By way of example, and not limitation, communication media includes wired media such as a wired network or direct-wired connection, and wireless media such as acoustic, RF, infrared and other wireless media. Combinations of the any of the above should also be included within the scope of computer-readable media.

By way of example, and not limitation, computer storage media may include volatile and non-volatile, removable and non-removable media implemented in any method or technology for storage of information such as computer-readable instructions, data structures, program modules or other data. For example, computer media includes, but is not limited to, RAM, ROM, EPROM, EEPROM, flash memory or other solid state memory technology, CD-ROM, digital versatile disks ("DVD"), HD-DVD, BLU-RAY, or other optical storage, magnetic cassettes, magnetic tape, magnetic disk storage or other magnetic storage devices, or any other medium which can be used to store the desired information and which can be accessed by the computer architecture **1200**. For purposes the claims, the phrase "computer storage medium" and variations thereof, does not include waves, signals, and/or other transitory and/or intangible communication media, per se.

According to various embodiments, the computer architecture **1200** may operate in a networked environment using logical connections to remote computers through a network **1218**. The computer architecture **1200** may connect to the network **1218** through a network interface unit **1220** connected to the bus **1210**. It should be appreciated that the network interface unit **1220** also may be utilized to connect to other types of networks and remote computer systems. The computer architecture **1200** also may include an input/output controller **1222** for receiving and processing input from a number of other devices, including a keyboard, mouse, or electronic stylus (not shown in FIG. **12**). Similarly, the input/output controller **1222** may provide output to a display screen, a printer, or other type of output device (also not shown in FIG. **12**).

It should be appreciated that the software components described herein may, when loaded into the CPU **1202** and executed, transform the CPU **1202** and the overall computer architecture **1200** from a general-purpose computing system into a special-purpose computing system customized to facilitate the functionality presented herein. The CPU **1202** may be constructed from any number of transistors or other discrete circuit elements, which may individually or collectively assume any number of states. More specifically, the CPU **1202** may operate as a finite-state machine, in response to executable instructions contained within the software modules disclosed herein. These computer-executable instructions may transform the CPU **1202** by specifying how the CPU **1202** transitions between states, thereby transforming the transistors or other discrete hardware elements constituting the CPU **1202**.

Encoding the software modules presented herein also may transform the physical structure of the computer-readable media presented herein. The specific transformation of physical structure may depend on various factors, in different implementations of this description. Examples of such factors may include, but are not limited to, the technology used to implement the computer-readable media, whether the computer-readable media is characterized as primary or secondary storage, and the like. For example, if the computer-readable media is implemented as semiconductor-based memory, the software disclosed herein may be encoded on the computer-readable media by transforming the physical state of the semiconductor memory. For example, the software may transform the state of transistors, capacitors, or other discrete circuit elements constituting the semiconductor memory. The software also may transform the physical state of such components in order to store data thereupon.

As another example, the computer-readable media disclosed herein may be implemented using magnetic or optical technology. In such implementations, the software presented herein may transform the physical state of magnetic or optical media, when the software is encoded therein. These transformations may include altering the magnetic characteristics of particular locations within given magnetic media. These transformations also may include altering the physical features or characteristics of particular locations within given optical media, to change the optical characteristics of those locations. Other transformations of physical media are possible without departing from the scope and spirit of the present description, with the foregoing examples provided only to facilitate this discussion.

In light of the above, it should be appreciated that many types of physical transformations take place in the computer architecture **1200** in order to store and execute the software components presented herein. It also should be appreciated that the computer architecture **1200** may include other types of computing devices, including hand-held computers, embedded computer systems, personal digital assistants, and other types of computing devices known to those skilled in the art. It is also contemplated that the computer architecture **1200** may not include all of the components shown in FIG. **12**, may include other components that are not explicitly shown in FIG. **12**, or may utilize an architecture completely different than that shown in FIG. **12**.

FIG. **13** illustrates an illustrative distributed computing environment **1300** capable of executing the software components described herein for creating and managing animations in a presentation application program. Thus, the distributed

computing environment **1300** illustrated in FIG. **13** can be utilized to execute any aspects of the software components presented herein. For example, the distributed computing environment **1300** can be utilized to execute aspects of the presentation application program described herein.

According to various implementations, the distributed computing environment **1300** includes a computing environment **1302** operating on, in communication with, or as part of the network **1304**. The network **1304** also can include various access networks. One or more client devices **1306**A-**1306**N (hereinafter referred to collectively and/or generically as "clients **1306**") can communicate with the computing environment **1302** via the network **1304** and/or other connections (not illustrated in FIG. **13**). In the illustrated embodiment, the clients **1306** include a computing device **1306**A such as a laptop computer, a desktop computer, or other computing device; a slate or tablet computing device ("tablet computing device") **1306**B; a mobile computing device **1306**C such as a mobile telephone, a smart phone, or other mobile computing device; a server computer **1306**D; and/or other devices **1306**N. It should be understood that any number of clients **1306** can communicate with the computing environment **1302**. Two example computing architectures for the clients **1306** are illustrated and described herein with reference to FIGS. **12** and **14**. It should be understood that the illustrated clients **1306** and computing architectures illustrated and described herein are illustrative, and should not be construed as being limited in any way.

In the illustrated embodiment, the computing environment **1302** includes application servers **1308**, data storage **1310**, and one or more network interfaces **1312**. According to various implementations, the functionality of the application servers **1308** can be provided by one or more server computers that are executing as part of, or in communication with, the network **1304**. The application servers **1308** can host various services, virtual machines, portals, and/or other resources. In the illustrated embodiment, the application servers **1308** host one or more virtual machines **1314** for hosting applications or other functionality. According to various implementations, the virtual machines **1314** host one or more applications and/or software modules for providing the functionality described herein for creating and managing animations in a presentation application program. It should be understood that this embodiment is illustrative, and should not be construed as being limiting in any way. The application servers **1308** also host or provide access to one or more Web portals, link pages, Web sites, and/or other information ("Web portals") **1316**.

According to various implementations, the application servers **1308** also include one or more mailbox services **1318** and one or more messaging services **1320**. The mailbox services **1318** can include electronic mail ("email") services. The mailbox services **1318** also can include various personal information management ("PIM") services including, but not limited to, calendar services, contact management services, collaboration services, and/or other services. The messaging services **1320** can include, but are not limited to, instant messaging services, chat services, forum services, and/or other communication services.

The application servers **1308** also can include one or more social networking services **1322**. The social networking services **1322** can include various social networking services including, but not limited to, services for sharing or posting status updates, instant messages, links, photos, videos, and/or other information; services for commenting or displaying interest in articles, products, blogs, or other resources; and/or other services. In some embodiments, the social networking services **1322** are provided by or include the FACEBOOK social networking service, the LINKEDIN professional networking service, the MYSPACE social networking service, the FOURSQUARE geographic networking service, the YAMMER office colleague networking service, and the like. In other embodiments, the social networking services **1322** are provided by other services, sites, and/or providers that may or may not be explicitly known as social networking providers. For example, some web sites allow users to interact with one another via email, chat services, and/or other means during various activities and/or contexts such as reading published articles, commenting on goods or services, publishing, collaboration, gaming, and the like. Examples of such services include, but are not limited to, the WINDOWS LIVE service and the XBOX LIVE service from Microsoft Corporation in Redmond, Wash. Other services are possible and are contemplated.

The social networking services **1322** also can include commenting, blogging, and/or micro blogging services. Examples of such services include, but are not limited to, the YELP commenting service, the KUDZU review service, the OFFICETALK enterprise micro blogging service, the TWITTER messaging service, the GOOGLE BUZZ service, and/or other services. It should be appreciated that the above lists of services are not exhaustive and that numerous additional and/or alternative social networking services **1322** are not mentioned herein for the sake of brevity. As such, the above embodiments are illustrative, and should not be construed as being limited in any way.

As shown in FIG. **13**, the application servers **1308** also can host other services, applications, portals, and/or other resources ("other resources") **1324**. The other resources **1324** can include, but are not limited to, the presentation application program. It thus can be appreciated that the computing environment **1302** can provide integration of the concepts and technologies disclosed herein provided herein for creating and managing animations with various mailbox, messaging, social networking, and/or other services or resources. For example, the concepts and technologies disclosed herein may utilize objects retrieved from various mailbox, messaging, social network, and/or other service or resources for insertion into one or more slides and/or one or more scenes. Animations may be authored for these objects. Moreover, custom animations may be retrieved from these services or resources.

As mentioned above, the computing environment **1302** can include the data storage **1310**. According to various implementations, the functionality of the data storage **1310** is provided by one or more databases operating on, or in communication with, the network **1304**. The functionality of the data storage **1310** also can be provided by one or more server computers configured to host data for the computing environment **1302**. The data storage **1310** can include, host, or provide one or more real or virtual datastores **1326**A-**1326**N (hereinafter referred to collectively and/or generically as "datastores **1326**"). The datastores **1326** are configured to host data used or created by the application servers **1308** and/or other data. Although not illustrated in FIG. **13**, the datastores **1326** also can host or store objects, animations, and/or other data utilized by a presentation application program.

The computing environment **1302** can communicate with, or be accessed by, the network interfaces **1312**. The network interfaces **1312** can include various types of network hardware and software for supporting communications between two or more computing devices including, but not limited to, the clients **1306** and the application servers **1308**. It should be

appreciated that the network interfaces **1312** also may be utilized to connect to other types of networks and/or computer systems.

It should be understood that the distributed computing environment **1300** described herein can provide any aspects of the software elements described herein with any number of virtual computing resources and/or other distributed computing functionality that can be configured to execute any aspects of the software components disclosed herein. According to various implementations of the concepts and technologies disclosed herein, the distributed computing environment **1300** provides the software functionality described herein as a service to the clients **1306**. It should be understood that the clients **1306** can include real or virtual machines including, but not limited to, server computers, web servers, personal computers, mobile computing devices, smart phones, and/or other devices. As such, various embodiments of the concepts and technologies disclosed herein enable any device configured to access the distributed computing environment **1300** to utilize the functionality described herein for creating and managing animations in a presentation application program.

Turning now to FIG. **14**, an illustrative computing device architecture **1400** for a computing device that is capable of executing various software components described herein for creating and managing animations in a presentation application program. The computing device architecture **1400** is applicable to computing devices that facilitate mobile computing due, in part, to form factor, wireless connectivity, and/or battery-powered operation. In some embodiments, the computing devices include, but are not limited to, mobile telephones, tablet devices, slate devices, portable video game devices, and the like. The computing device architecture **1400** is applicable to any of the clients **1306** shown in FIG. **13**. Moreover, aspects of the computing device architecture **1400** may be applicable to traditional desktop computers, portable computers (e.g., laptops, notebooks, ultra-portables, and netbooks), server computers, and other computer systems, such as described herein with reference to FIG. **12**. For example, the single touch and multi-touch aspects disclosed herein below may be applied to desktop computers that utilize a touchscreen or some other touch-enabled device, such as a touch-enabled track pad or touch-enabled mouse.

The computing device architecture **1400** illustrated in FIG. **14** includes a processor **1402**, memory components **1404**, network connectivity components **1406**, sensor components **1408**, input/output components **1410**, and power components **1412**. In the illustrated embodiment, the processor **1402** is in communication with the memory components **1404**, the network connectivity components **1406**, the sensor components **1408**, the input/output ("I/O") components **1410**, and the power components **1412**. Although no connections are shown between the individuals components illustrated in FIG. **14**, the components can interact to carry out device functions. In some embodiments, the components are arranged so as to communicate via one or more busses (not shown).

The processor **1402** includes a central processing unit ("CPU") configured to process data, execute computer-executable instructions of one or more application programs, and communicate with other components of the computing device architecture **1400** in order to perform various functionality described herein. The processor **1402** may be utilized to execute aspects of the software components presented herein and, particularly, those that utilize, at least in part, a touch-enabled input.

In some embodiments, the processor **1402** includes a graphics processing unit ("GPU") configured to accelerate operations performed by the CPU, including, but not limited to, operations performed by executing general-purpose scientific and engineering computing applications, as well as graphics-intensive computing applications such as high resolution video (e.g., 720P, 1080P, and higher resolution), video games, three-dimensional ("3D") modeling applications, and the like. In some embodiments, the processor **1402** is configured to communicate with a discrete GPU (not shown). In any case, the CPU and GPU may be configured in accordance with a co-processing CPU/GPU computing model, wherein the sequential part of an application executes on the CPU and the computationally-intensive part is accelerated by the GPU.

In some embodiments, the processor **1402** is, or is included in, a system-on-chip ("SoC") along with one or more of the other components described herein below. For example, the SoC may include the processor **1402**, a GPU, one or more of the network connectivity components **1406**, and one or more of the sensor components **1408**. In some embodiments, the processor **1402** is fabricated, in part, utilizing a package-on-package ("PoP") integrated circuit packaging technique. Moreover, the processor **1402** may be a single core or multi-core processor.

The processor **1402** may be created in accordance with an ARM architecture, available for license from ARM HOLDINGS of Cambridge, United Kingdom. Alternatively, the processor **1402** may be created in accordance with an x86 architecture, such as is available from INTEL CORPORATION of Mountain View, Calif. and others. In some embodiments, the processor **1402** is a SNAPDRAGON SoC, available from QUALCOMM of San Diego, Calif., a TEGRA SoC, available from NVIDIA of Santa Clara, Calif., a HUMMINGBIRD SoC, available from SAMSUNG of Seoul, South Korea, an Open Multimedia Application Platform ("OMAP") SoC, available from TEXAS INSTRUMENTS of Dallas, Tex., a customized version of any of the above SoCs, or a proprietary SoC.

The memory components **1404** include a random access memory ("RAM") **1414**, a read-only memory ("ROM") **1416**, an integrated storage memory ("integrated storage") **1418**, and a removable storage memory ("removable storage") **1420**. In some embodiments, the RAM **1414** or a portion thereof, the ROM **1416** or a portion thereof, and/or some combination the RAM **1414** and the ROM **1416** is integrated in the processor **1402**. In some embodiments, the ROM **1416** is configured to store a firmware, an operating system or a portion thereof (e.g., operating system kernel), and/or a bootloader to load an operating system kernel from the integrated storage **1418** or the removable storage **1420**.

The integrated storage **1418** can include a solid-state memory, a hard disk, or a combination of solid-state memory and a hard disk. The integrated storage **1418** may be soldered or otherwise connected to a logic board upon which the processor **1402** and other components described herein also may be connected. As such, the integrated storage **1418** is integrated in the computing device. The integrated storage **1418** is configured to store an operating system or portions thereof, application programs, data, and other software components described herein.

The removable storage **1420** can include a solid-state memory, a hard disk, or a combination of solid-state memory and a hard disk. In some embodiments, the removable storage **1420** is provided in lieu of the integrated storage **1418**. In other embodiments, the removable storage **1420** is provided as additional optional storage. In some embodiments, the removable storage **1420** is logically combined with the integrated storage **1418** such that the total available storage is

made available and shown to a user as a total combined capacity of the integrated storage **1418** and the removable storage **1420**.

The removable storage **1420** is configured to be inserted into a removable storage memory slot (not shown) or other mechanism by which the removable storage **1420** is inserted and secured to facilitate a connection over which the removable storage **1420** can communicate with other components of the computing device, such as the processor **1402**. The removable storage **1420** may be embodied in various memory card formats including, but not limited to, PC card, CompactFlash card, memory stick, secure digital ("SD"), miniSD, microSD, universal integrated circuit card ("UICC") (e.g., a subscriber identity module ("SIM") or universal SIM ("USIM")), a proprietary format, or the like.

It can be understood that one or more of the memory components **1404** can store an operating system. According to various embodiments, the operating system includes, but is not limited to, SYMBIAN OS from SYMBIAN LIMITED, WINDOWS MOBILE OS from Microsoft Corporation of Redmond, Wash., WINDOWS PHONE OS from Microsoft Corporation, WINDOWS from Microsoft Corporation, PALM WEBOS from Hewlett-Packard Company of Palo Alto, Calif., BLACKBERRY OS from Research In Motion Limited of Waterloo, Ontario, Canada, IOS from Apple Inc. of Cupertino, Calif., and ANDROID OS from Google Inc. of Mountain View, Calif. Other operating systems are contemplated.

The network connectivity components **1406** include a wireless wide area network component ("WWAN component") **1422**, a wireless local area network component ("WLAN component") **1424**, and a wireless personal area network component ("WPAN component") **1426**. The network connectivity components **1406** facilitate communications to and from a network **1428**, which may be a WWAN, a WLAN, or a WPAN. Although a single network **1428** is illustrated, the network connectivity components **1406** may facilitate simultaneous communication with multiple networks. For example, the network connectivity components **1406** may facilitate simultaneous communications with multiple networks via one or more of a WWAN, a WLAN, or a WPAN.

The network **1428** may be a WWAN, such as a mobile telecommunications network utilizing one or more mobile telecommunications technologies to provide voice and/or data services to a computing device utilizing the computing device architecture **1400** via the WWAN component **1422**. The mobile telecommunications technologies can include, but are not limited to, Global System for Mobile communications ("GSM"), Code Division Multiple Access ("CDMA") ONE, CDMA2000, Universal Mobile Telecommunications System ("UMTS"), Long Term Evolution ("LTE"), and Worldwide Interoperability for Microwave Access ("WiMAX"). Moreover, the network **1428** may utilize various channel access methods (which may or may not be used by the aforementioned standards) including, but not limited to, Time Division Multiple Access ("TDMA"), Frequency Division Multiple Access ("FDMA"), CDMA, wideband CDMA ("W-CDMA"), Orthogonal Frequency Division Multiplexing ("OFDM"), Space Division Multiple Access ("SDMA"), and the like. Data communications may be provided using General Packet Radio Service ("GPRS"), Enhanced Data rates for Global Evolution ("EDGE"), the High-Speed Packet Access ("HSPA") protocol family including High-Speed Downlink Packet Access ("HSDPA"), Enhanced Uplink ("EUL") or otherwise termed High-Speed Uplink Packet Access ("HSUPA"), Evolved HSPA ("HSPA+"), LTE, and various other current and future wireless data access standards. The network **1428** may be configured to provide voice and/or data communications with any combination of the above technologies. The network **1428** may be configured to or adapted to provide voice and/or data communications in accordance with future generation technologies.

In some embodiments, the WWAN component **1422** is configured to provide dual-multi-mode connectivity to the network **1428**. For example, the WWAN component **1422** may be configured to provide connectivity to the network **1428**, wherein the network **1428** provides service via GSM and UMTS technologies, or via some other combination of technologies. Alternatively, multiple WWAN components **1422** may be utilized to perform such functionality, and/or provide additional functionality to support other non-compatible technologies (i.e., incapable of being supported by a single WWAN component). The WWAN component **1422** may facilitate similar connectivity to multiple networks (e.g., a UMTS network and an LTE network).

The network **1428** may be a WLAN operating in accordance with one or more Institute of Electrical and Electronic Engineers ("IEEE") 802.11 standards, such as IEEE 802.11a, 802.11b, 802.11g, 802.11n, and/or future 802.11 standard (referred to herein collectively as WI-FI). Draft 802.11 standards are also contemplated. In some embodiments, the WLAN is implemented utilizing one or more wireless WI-FI access points. In some embodiments, one or more of the wireless WI-FI access points are another computing device with connectivity to a WWAN that are functioning as a WI-FI hotspot. The WLAN component **1424** is configured to connect to the network **1428** via the WI-FI access points. Such connections may be secured via various encryption technologies including, but not limited, WI-FI Protected Access ("WPA"), WPA2, Wired Equivalent Privacy ("WEP"), and the like.

The network **1428** may be a WPAN operating in accordance with Infrared Data Association ("IrDA"), BLUETOOTH, wireless Universal Serial Bus ("USB"), Z-Wave, ZIGBEE, or some other short-range wireless technology. In some embodiments, the WPAN component **1426** is configured to facilitate communications with other devices, such as peripherals, computers, or other computing devices via the WPAN.

The sensor components **1408** include a magnetometer **1428**, an ambient light sensor **1430**, a proximity sensor **1432**, an accelerometer **1434**, a gyroscope **1436**, and a Global Positioning System sensor ("GPS sensor") **1438**. It is contemplated that other sensors, such as, but not limited to, temperature sensors or shock detection sensors, also may be incorporated in the computing device architecture **1400**.

The magnetometer **1428** is configured to measure the strength and direction of a magnetic field. In some embodiments the magnetometer **1428** provides measurements to a compass application program stored within one of the memory components **1404** in order to provide a user with accurate directions in a frame of reference including the cardinal directions, north, south, east, and west. Similar measurements may be provided to a navigation application program that includes a compass component. Other uses of measurements obtained by the magnetometer **1428** are contemplated.

The ambient light sensor **1430** is configured to measure ambient light. In some embodiments, the ambient light sensor **1430** provides measurements to an application program stored within one the memory components **1404** in order to automatically adjust the brightness of a display (described

below) to compensate for low-light and high-light environments. Other uses of measurements obtained by the ambient light sensor **1430** are contemplated.

The proximity sensor **1432** is configured to detect the presence of an object or thing in proximity to the computing device without direct contact. In some embodiments, the proximity sensor **1432** detects the presence of a user's body (e.g., the user's face) and provides this information to an application program stored within one of the memory components **1404** that utilizes the proximity information to enable or disable some functionality of the computing device. For example, a telephone application program may automatically disable a touchscreen (described below) in response to receiving the proximity information so that the user's face does not inadvertently end a call or enable/disable other functionality within the telephone application program during the call. Other uses of proximity as detected by the proximity sensor **1432** are contemplated.

The accelerometer **1434** is configured to measure proper acceleration. In some embodiments, output from the accelerometer **1434** is used by an application program as an input mechanism to control some functionality of the application program. For example, the application program may be a video game in which a character, a portion thereof, or an object is moved or otherwise manipulated in response to input received via the accelerometer **1434**. In some embodiments, output from the accelerometer **1434** is provided to an application program for use in switching between landscape and portrait modes, calculating coordinate acceleration, or detecting a fall. Other uses of the accelerometer **1434** are contemplated.

The gyroscope **1436** is configured to measure and maintain orientation. In some embodiments, output from the gyroscope **1436** is used by an application program as an input mechanism to control some functionality of the application program. For example, the gyroscope **1436** can be used for accurate recognition of movement within a 3D environment of a video game application or some other application. In some embodiments, an application program utilizes output from the gyroscope **1436** and the accelerometer **1434** to enhance control of some functionality of the application program. Other uses of the gyroscope **1436** are contemplated.

The GPS sensor **1436** is configured to receive signals from GPS satellites for use in calculating a location. The location calculated by the GPS sensor **1438** may be used by any application program that requires or benefits from location information. For example, the location calculated by the GPS sensor **1438** may be used with a navigation application program to provide directions from the location to a destination or directions from the destination to the location. Moreover, the GPS sensor **1438** may be used to provide location information to an external location-based service, such as E911 service. The GPS sensor **1438** may obtain location information generated via WI-FI, WIMAX, and/or cellular triangulation techniques utilizing one or more of the network connectivity components **1406** to aid the GPS sensor **1438** in obtaining a location fix. The GPS sensor **1438** may also be used in Assisted GPS ("A-GPS") systems.

The I/O components **1410** include a display **1440**, a touchscreen **1442**, a data I/O interface component ("data I/O") **1444**, an audio I/O interface component ("audio I/O") **1446**, a video I/O interface component ("video I/O") **1448**, and a camera **1450**. In some embodiments, the display **1440** and the touchscreen **1442** are combined. In some embodiments two or more of the data I/O component **1444**, the audio I/O component **1446**, and the video I/O component **1448** are combined. The I/O components **1410** may include discrete processors configured to support the various interface described below, or may include processing functionality built-in to the processor **1402**.

The display **1440** is an output device configured to present information in a visual form. In particular, the display **1440** may present graphical user interface ("GUI") elements, text, images, video, notifications, virtual buttons, virtual keyboards, messaging data, Internet content, device status, time, date, calendar data, preferences, map information, location information, and any other information that is capable of being presented in a visual form. In some embodiments, the display **1440** is a liquid crystal display ("LCD") utilizing any active or passive matrix technology and any backlighting technology (if used). In some embodiments, the display **1440** is an organic light emitting diode ("OLED") display. Other display types are contemplated.

The touchscreen **1442** is an input device configured to detect the presence and location of a touch. The touchscreen **1442** may be a resistive touchscreen, a capacitive touchscreen, a surface acoustic wave touchscreen, an infrared touchscreen, an optical imaging touchscreen, a dispersive signal touchscreen, an acoustic pulse recognition touchscreen, or may utilize any other touchscreen technology. In some embodiments, the touchscreen **1442** is incorporated on top of the display **1440** as a transparent layer to enable a user to use one or more touches to interact with objects or other information presented on the display **1440**. In other embodiments, the touchscreen **1442** is a touch pad incorporated on a surface of the computing device that does not include the display **1440**. For example, the computing device may have a touchscreen incorporated on top of the display **1440** and a touch pad on a surface opposite the display **1440**.

In some embodiments, the touchscreen **1442** is a single-touch touchscreen. In other embodiments, the touchscreen **1442** is a multi-touch touchscreen. In some embodiments, the touchscreen **1442** is configured to detect discrete touches, single touch gestures, and/or multi-touch gestures. These are collectively referred to herein as gestures for convenience. Several gestures will now be described. It should be understood that these gestures are illustrative and are not intended to limit the scope of the appended claims. Moreover, the described gestures, additional gestures, and/or alternative gestures may be implemented in software for use with the touchscreen **1442**. As such, a developer may create gestures that are specific to a particular application program.

In some embodiments, the touchscreen **1442** supports a tap gesture in which a user taps the touchscreen **1442** once on an item presented on the display **1440**. The tap gesture may be used for various reasons including, but not limited to, opening or launching whatever the user taps. In some embodiments, the touchscreen **1442** supports a double tap gesture in which a user taps the touchscreen **1442** twice on an item presented on the display **1440**. The double tap gesture may be used for various reasons including, but not limited to, zooming in or zooming out in stages. In some embodiments, the touchscreen **1442** supports a tap and hold gesture in which a user taps the touchscreen **1442** and maintains contact for at least a pre-defined time. The tap and hold gesture may be used for various reasons including, but not limited to, opening a context-specific menu.

In some embodiments, the touchscreen **1442** supports a pan gesture in which a user places a finger on the touchscreen **1442** and maintains contact with the touchscreen **1442** while moving the finger on the touchscreen **1442**. The pan gesture may be used for various reasons including, but not limited to, moving through screens, images, or menus at a controlled rate. Multiple finger pan gestures are also contemplated. In

some embodiments, the touchscreen **1442** supports a flick gesture in which a user swipes a finger in the direction the user wants the screen to move. The flick gesture may be used for various reasons including, but not limited to, scrolling horizontally or vertically through menus or pages. In some embodiments, the touchscreen **1442** supports a pinch and stretch gesture in which a user makes a pinching motion with two fingers (e.g., thumb and forefinger) on the touchscreen **1442** or moves the two fingers apart. The pinch and stretch gesture may be used for various reasons including, but not limited to, zooming gradually in or out of a website, map, or picture.

Although the above gestures have been described with reference to the use one or more fingers for performing the gestures, other appendages such as toes or objects such as styluses may be used to interact with the touchscreen **1442**. As such, the above gestures should be understood as being illustrative and should not be construed as being limiting in any way.

In some embodiments, interaction with the user interface **100** and portions thereof, such as the animation pane **106**, as described above with reference to FIGS. **1** and **2**, and input for the direct manipulation of objects to create animations in accordance with the various aspects disclosed herein, may be facilitated via the touchscreen **1442**. Referring briefly to FIG. **15**, an exemplary tablet device **1500** is illustrated with the user interface **100** being shown on a display of the tablet device **1500** in a landscape mode. The display of the tablet device **1500** is or includes a touchscreen, such as the touchscreen **1442**. As such, the tablet device **1500** is configured to receive a touch input **1502** to interact with the user interface **100**. Although the touch input **1502** is illustrated as a single discrete touch, the touch input **1502** alternatively may be multiple discrete touches, a single touch gesture, or a multi-touch gesture, such as those described above.

The data I/O interface component **1444** is configured to facilitate input of data to the computing device and output of data from the computing device. In some embodiments, the data I/O interface component **1444** includes a connector configured to provide wired connectivity between the computing device and a computer system, for example, for synchronization operation purposes. The connector may be a proprietary connector or a standardized connector such as USB, micro-USB, mini-USB, or the like. In some embodiments, the connector is a dock connector for docking the computing device with another device such as a docking station, audio device (e.g., a digital music player), or video device.

The audio I/O interface component **1446** is configured to provide audio input and/or output capabilities to the computing device. In some embodiments, the audio I/O interface component **1444** includes a microphone configured to collect audio signals. In some embodiments, the audio I/O interface component **1444** includes a headphone jack configured to provide connectivity for headphones or other external speakers. In some embodiments, the audio interface component **1446** includes a speaker for the output of audio signals. In some embodiments, the audio I/O interface component **1444** includes an optical audio cable out.

The video I/O interface component **1448** is configured to provide video input and/or output capabilities to the computing device. In some embodiments, the video I/O interface component **1448** includes a video connector configured to receive video as input from another device (e.g., a video media player such as a DVD or BLURAY player) or send video as output to another device (e.g., a monitor, a television, or some other external display). In some embodiments, the video I/O interface component **1448** includes a High-Definition Multimedia Interface ("HDMI"), mini-HDMI, micro-HDMI, DisplayPort, or proprietary connector to input/output video content. In some embodiments, the video I/O interface component **1448** or portions thereof is combined with the audio I/O interface component **1446** or portions thereof.

The camera **1450** can be configured to capture still images and/or video. The camera **1450** may utilize a charge coupled device ("CCD") or a complementary metal oxide semiconductor ("CMOS") image sensor to capture images. In some embodiments, the camera **1450** includes a flash to aid in taking pictures in low-light environments. Settings for the camera **1450** may be implemented as hardware or software buttons.

Although not illustrated, one or more hardware buttons may also be included in the computing device architecture **1400**. The hardware buttons may be used for controlling some operational aspect of the computing device. The hardware buttons may be dedicated buttons or multi-use buttons. The hardware buttons may be mechanical or sensor-based.

The illustrated power components **1412** include one or more batteries **1452**, which can be connected to a battery gauge **1454**. The batteries **1452** may be rechargeable or disposable. Rechargeable battery types include, but are not limited to, lithium polymer, lithium ion, nickel cadmium, and nickel metal hydride. Each of the batteries **1452** may be made of one or more cells.

The battery gauge **1454** can be configured to measure battery parameters such as current, voltage, and temperature. In some embodiments, the battery gauge **1454** is configured to measure the effect of a battery's discharge rate, temperature, age and other factors to predict remaining life within a certain percentage of error. In some embodiments, the battery gauge **1454** provides measurements to an application program that is configured to utilize the measurements to present useful power management data to a user. Power management data may include one or more of a percentage of battery used, a percentage of battery remaining, a battery condition, a remaining time, a remaining capacity (e.g., in watt hours), a current draw, and a voltage.

The power components **1412** may also include a power connector, which may be combined with one or more of the aforementioned I/O components **1410**. The power components **1412** may interface with an external power system or charging equipment via a power I/O component.

Based on the foregoing, it should be appreciated that concepts and technologies for have been disclosed herein for creating and managing animations in a presentation application program. Although the subject matter presented herein has been described in language specific to computer structural features, methodological and transformative acts, specific computing machinery, and computer readable media, it is to be understood that the invention defined in the appended claims is not necessarily limited to the specific features, acts, or media described herein. Rather, the specific features, acts and mediums are disclosed as example forms of implementing the claims.

The subject matter described above is provided by way of illustration only and should not be construed as limiting. Various modifications and changes may be made to the subject matter described herein without following the example embodiments and applications illustrated and described, and without departing from the true spirit and scope of the present invention, which is set forth in the following claims.

We claim:

1. A computer-readable storage medium comprising computer-executable instructions that, when executed by a computer, cause the computer to:

present, on a display that is in communication with the computer, a canvas and an object on the canvas;

receive a start point and an end point, the start point and end point located on a motion path object;

receive a motion path object animation effect for the object;

present, on the display, the object, the start point, the end point, and the motion path object on the canvas;

receive a selection of the motion path object;

in response to the motion path object being selected, present a ghost version of the object in proximity to the end point, the ghost version of the object representing the object after the motion path object animation effect has been performed;

add the motion path object animation effect to an animation timeline, the animation timeline comprising a plurality of animation effects; and

analyze the plurality of animation effects in the animation timeline to determine one or more discrete states generated for the animation timeline and determine which of the plurality of animation effects in the animation timeline are triggered by an after previous trigger or a user-controlled trigger, wherein each of the one or more discrete states includes at least one animation effect and wherein an animation effect that is triggered by the after previous trigger or the user-controlled trigger indicates a start of a discrete state of the one or more discrete states generated for the animation timeline.

2. The computer-readable storage medium of claim **1**, further comprising computer-executable instructions that, when executed by the computer, cause the computer to:

receive a selection of the end point and a subsequent dragging of the end point to a new position on the canvas; and

present, on the display, the end point at the new position on the canvas and the ghost version of the object in proximity to the end point at the new position on the canvas.

3. The computer-readable storage medium of claim **1**, wherein the ghost version of the object being presented in proximity to the end point comprises the ghost version of the object being presented so as to at least partially intersect the end point.

4. The computer-readable storage medium of claim **1**, wherein the ghost version of the object being presented in proximity to the end point comprises the ghost version of the object so as to not intersect the end point.

5. The computer-readable storage medium of claim **1**, further comprising computer-executable instructions that, when executed by the computer, cause the computer to:

receive an input of a new start point and a new end point for the object; and

scale the motion path object of the motion path object animation effect to fit between the new start point and the new end point for the object.

6. The computer-readable storage medium of claim **1**, further comprising computer-executable instructions that, when executed by the computer, cause the computer to:

present an animation pane in a user interface, the animation pane comprising a scenes view comprising one or more scenes of a slide, each of the one or more scenes of a slide comprising a visualization of a discrete state for each of the one or more discrete states generated for the animation timeline.

7. The computer-readable storage medium of claim **6**, wherein the scenes view reorders the scenes of a slide by selecting a scene and moving the selected scene to a new location within the animation pane.

8. The computer-readable storage medium of claim **6**, wherein the animation pane further comprises a list view.

9. The computer-readable storage medium of claim **8**, wherein the list view reorders the scenes of a slide by selecting a scene and moving the selected scene to a new location within the animation pane.

10. The computer-readable storage medium of claim **6**, further comprising computer-executable instructions that, when executed by the computer, cause the computer to:

receive a selection of a scene of a slide in the scenes view;

receive a delete command; and

in response to receiving the delete command, delete the selected scene.

11. A computer-implemented method for animation creation and management, the method comprising:

presenting, on a display that is in communication with a computer, a canvas and an object on the canvas;

receiving a start point and an end point, the start point and end point located on a motion path object;

receiving a motion path object animation effect for the object;

presenting, on the display, the object, the start point, the end point, and the motion path object on the canvas;

receiving a selection of the motion path object;

in response to the motion path object being selected, present a ghost version of the object in proximity to the start point, and the ghost version of the object represents the object at a beginning of the motion path object animation effect;

adding the motion path object animation effect to an animation timeline, the animation timeline comprising a plurality of animation effects; and

analyzing the plurality of animation effects in the animation timeline to determine which of the plurality of animation effects in the animation timeline are triggered by an after previous trigger or a user-controlled trigger, and wherein an animation effect that is triggered by the after previous trigger or the user-controlled trigger indicates a start of a discrete state of one or more discrete states generated for the animation timeline.

12. The computer-implemented method of claim **11**, further comprising:

receiving a selection of the start point and a subsequent dragging of the start point to a new position on the canvas; and

presenting, on the display, the start point at the new position on the canvas and the ghost version of the object in proximity to the start point at the new position on the canvas.

13. The computer-implemented method of claim **11**, wherein the ghost version of the object being presented in proximity to the end point comprises the ghost version of the object being presented so as to at least partially intersect the end point.

14. The computer-implemented method of claim **11**, wherein the ghost version of the object being presented in proximity to the end point comprises the ghost version of the object so as to not intersect the end point.

15. The computer-implemented method of claim **11**, further comprising:

receiving an input of a new start point and a new end point for the object; and

scaling the motion path object of the motion path object animation effect to fit between the new start point and the new end point for the object.

16. The computer-implemented method of claim **11**, further comprising:

presenting an animation pane in a user interface, the animation pane comprising a scenes view comprising one

or more scenes of a slide, each of the one or more scenes of a slide comprising a visualization of a discrete state for each of the one or more discrete states generated for the animation timeline.

17. The computer-implemented method of claim **16**, wherein the scenes view reorders the scenes of a slide by selecting a scene and moving the selected scene to a new location within the animation pane.

18. The computer-implemented method of claim **16**, wherein the animation pane further comprises a list view which reorders the scenes of a slide by selecting a scene and moving the selected scene to a new location within the animation pane.

19. An apparatus, comprising:

a processor; and

a computer-readable storage media having instructions stored thereupon which, when executed by the processor, cause the apparatus to

generate a slide presentation comprising one or more slides,

present, on a display that is in communication with the apparatus, a slide canvas of one of the one or more slides,

receive an object for presenting on the slide canvas,

present, on the display, the object on the slide canvas,

receive a start point and an end point, the start point and end point located on a motion path object;

receive a motion path object animation effect for the object, the motion path animation effect comprising a line, an arc, a turn, a shape, a loop, or a custom motion path,

add the motion path object animation effect to an animation timeline, the animation timeline comprising a plurality of animation effects,

analyze the plurality of animation effects in the animation timeline to determine which of the plurality of animation effects in the animation timeline are triggered by an after previous trigger or a user-controlled trigger, and wherein an animation effect that is triggered by the after previous trigger or the user-controlled trigger indicates a start of a discrete state of one or more discrete states generated for the animation timeline,

present, on the display, the start point, the end point, and the motion path object of the motion path object animation effect on the slide canvas,

receive a selection of the motion path object,

in response to the motion path object being selected, present, on the display, a ghost version of the object in proximity to the start point on the slide canvas, and

present, on the display, the slide presentation in a slide show view during which the object is animated in accordance with the motion path object animation effect.

20. The apparatus of claim **19**, further comprising computer-executable instructions that, when executed by the processor, cause the apparatus to:

present an animation pane in a user interface, the animation pane comprising a scenes view comprising one or more scenes of a slide, each of the one or more scenes of a slide comprising a visualization of a discrete state for each of the one or more discrete states generated for the animation timeline.

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